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### Contributions.

**The "Lightning Express" - St. Petersburg and Moscow.**

Cincinnati, Feb. 10.

To the Editor of the "Railroad Gazette":

I see a note on page 83 of Feb. 4 "Railroad Gazette" in regard to a lightning express between St. Petersburg and Moscow. You will notice that it is said that the distance between St. Petersburg and Moscow is 400 miles and that the oldest railroad of any length in Russia is still a single-track road.

This road was opened in 1851, is a double track all the way, always has been and was opened as a double-track road. My information in regard to this is liable to be correct, because I had charge of the mechanical department of the St. Petersburg end of the line of railroad from 1855 to August, 1862. If you were here in my office I could show you the first time card of the road, as well as a profile of it.

The statement that they were to put on a lighting express in November last, to leave either terminus at 8 o'clock in the morning and to arrive at the other at 4 o'clock in the afternoon, is rather extravagant. I was over the line with the Emperor several times, while there, and, whenever we took the Emperor over the road every switch was spiked and the road thoroughly guarded and we ran at a high speed. Ten hours was considered smart time, and I do not believe that they are able to improve on that time even now.

This line was started to be built to imitate a cheap American railroad. It was laid on 28 inches of broken stone, and everything else in proportion; probably the most perfect railroad ever built, and in the building and early operating of which occurred very many interesting events that are worthy of being observed as railroad history. FRED C. WIER.

## Easy Roads to Science.

New York, Feb. 12.

To the Editor of the "Railroad Gazette:"

I have read your notice of Prof. Merriman's little book, "The Strength of Materials: A Text Book for Manual Training Schools," and agree with you that the several topics included are clearly and correctly, though briefly, treated; but so much the worse. It appears that the intention of the author is to present the subject covered by the title, presumably so that students of "high schools" and "manual training schools," without further discipline or instruction, may practically apply the principles and rules laid down to the design of structural works.

Technical books of this character are misleading and mischievous, the more so, the greater the clearness and correctness of the printed text:

"A little learning is a dangerous thing,  
Drink deep or taste not the Pierian spring,  
Their shallow draughts intoxicate the brain,  
And drinking largely sobers us again."

The critic, some time ago, casually met a younger man, engineer of a local and successful bridge building corporation, and in conversation inquired: "What technical training have you?" "Not any," he replied. "With Osborne's Tables and Carnegie's Pocket Book, any engineer is well equipped."

"The woods are full" of specifics, the sale of which is urged upon the invalid, each guaranteed to cure all diseases. The regular practitioner knows that the

large use of these, ignorantly taken, promotes not only his regular practice, but largely increases the number of invalids. The question arises, whether those who know best about what is required for practical service by the professional man should in condensed form present to the novice what may appear to the latter to be sufficient for his training. As above stated, such is misleading and mischievous.

CLASS OF '57.

[We do not fear that the youth of the country will be corrupted or led astray in the sloughs of conceit and self-sufficiency by Prof. Merriman's little book. Doubtless generations of Americans have been misled, to the damage and even the peril of the nation, by the vicious teaching, through generations, that an American can do anything, even without learning anything; but Prof. Merriman's book is exactly calculated to counteract that kind of teaching by bringing a glimpse of exact science to many who would never get it otherwise.—Editor Railroad Gazette.]

### High Carbon Angle Plates—Continuous Rails.

New York, Feb. 2, 1898.

To the Editor of the "Railroad Gazette:"

Mr. A. Torrey, Chief Engineer of the Michigan Central Railroad, consents, at my solicitation, that the subjoined letter shall be given to you for printing. It was written in answer to one from me inquiring as to the present status of the series of continuous rails laid by him on the Michigan Central in the fall of 1893. The letter contains so many direct and valuable facts that I do not doubt it will prove as interesting to most of your readers as it has to me;

This experimental track was composed of rail stretches 800 ft., 500 ft., two of 250 ft. and two of 100 ft., making 2,000 ft. in all, or 1,000 ft. of track. The rails were 30 ft. long, but were made practically continuous in each stretch, after the rails had been placed in abutment, by drilling them and their splices at each joint with round holes, in which turned bolts were fitted. Expansion devices were placed at the end of each stretch, and the movement of the rails at various points, with their temperatures and the atmospheric temperature, was recorded at frequent intervals.

The main portion of the letter deals pertinently with the question of elastic track, of which so much has been recently printed in these columns.

GEO. H. PAINE.

The rail which is described in the "Railroad Gazette" of July 27, 1894, is still in service, and I think it is about the best thousand feet of track that we have.

I have noticed for many years that ordinary angle plates will in a very short time take so great a degree of set that they overcome the inherent elasticity of the rail ends, and hold the rail ends down sufficiently to make a noticeable and a material departure from a continuous surface at the joint. This unpleasant situation occurs not occasionally, but at almost every joint which has been under traffic for a short time. I believed that the material used in the commercial splice had much to do with the tendency of the splice to assume this set, and last year I put into service some 40 miles of angle plates of the usual pattern, the composition of which was very high in carbon, I think between .65 and .75. They were made from open-hearth steel, and the phosphorus was low, I think about .05. I gave these splices very severe pressure tests in the shop and found that their recovery after deflection, I think up to a fourth of an inch, was perfect, while splices of .10 carbon showed very little return after a similar deflection.

That I might get a quick test of the quality of this kind of steel under the service which it has to undergo in the track, I bought enough of the same material to replace splices which had been in service where the rail was about five years old, and somewhat worn. I think the amount of traffic which has been carried over the 1897 rails laid with the high carbon splices has depressed the splices very little, but the service given by the high carbon splice to older rail has not been so satisfactory, and a great number of the splices in the mile I speak of have taken a permanent set; some of them quite a large permanent set.

When this set under service developed, I thought it possible that some modifications in the form of the splices would enable them to yield under the blow of the wheel and return to their original shape. To this end I ground a number of the splices; gave them freedom from contact with the rail at various points, and put them under a steam hammer, by which I depressed them to a definite amount. Although some slight benefit seems to have resulted from the relief of contact, the benefit seems so slight that I feel discouraged in attempting to secure angle splices of such a form or such a composition as shall result in restoring the joint to its original position after the depression which it suffers from the passing wheel.

I think of no way to secure either the requisite stiffness or perfect elasticity of the joint without using greater depth for the fastening than the rail section affords, and it is clear that I cannot use any depth below the top of the tie for such a fastening in connection with long rail, since the movement toward the end of the long rail is considerable, and the opportunity for this movement cannot be found in ordinary roadbed. I am consequently undecided as to whether I shall make any further attempt to use rails of greater length than 30 ft. I think the interruption to the continuity of the rail to the extent of the necessary opening for expansion of 30-ft. rail has not very much to do with its wear, or with the shock in passing from one rail end to the other. I think far more of the shock and the wear comes from the set (otherwise the weakness) in the angle splice.

I have the joints of the long rail (the 1,000-ft. stretch), which is now in service, critically examined every year, and I find that the permanent set is about a sixty-fourth of an inch in a length of 8 in., and I am surprised to see that this amount of set does not seem to increase, while the rail shows little wear, although a very heavy tonnage passes over it. Nevertheless, even this slight depression every thirty feet would make a noise and a shock at a high rate of speed. On the whole, I consider the 500 ft. of continuous rail, with its opportunity for free expansion at each end, far safer as against sun kinks than 30-ft. rails held by six-bolt angle plates with the bolts kept tight. I foresee no difficulty in making expansion joints commercially.

A. TORREY.

### Train Resistance.

To the Editor of the "Railroad Gazette:"

I have carefully read the article regarding the resistance of trains and locomotives, in your issue of January 14, noting that it is a translation in condensed form from a recent work of A. von Borries. A criticism might be made regarding the resistance formulae given in the article, as very little is said of the manner in which they were derived; whether the formulae are based upon experimental data or partly upon theoretical suppositions. To enable everyone to comprehend and weigh the value of these expressions for practical use it would be necessary to show the details of each test, if train tests were made, and also to know how each term of the formulae was obtained.

For practical use a satisfactory formula for train resistance should contain a term or factor which varies according to the load per journal; as, for instance, it is known that the resistance per ton of ordinary empty coal cars is not far from twice that of the same cars loaded. Also, all the resistance formulae given by Mr. von Borries will probably give results too high, and the formula in your editorial with the article doubtless gives results approximating nearer the resistance of trains in this country. It may be, however, that the formulae given by Mr. von Borries apply more closely to Continental practice, where swivel trucks are not commonly used. The rolling action of cars not equipped with trucks would undoubtedly greatly increase the friction between the wheel flanges and the rails, and it is well known that the rolling friction is a large factor in the total train resistance when from any cause the wheel flanges are made to run against the rails.

Many formulae have been presented for train resistance, each of which is in more or less different terms and coefficients, and they give widely different results. This is because only one or more of them are correct, or because the conditions are different for each formula. It, therefore, becomes evident how important it is that a description of the tests and a full statement of the conditions surrounding the tests should accompany any resistance formula, so as to give it its own specific value.

To determine practically complete resistance formulæ it is desirable to know the work done in the cylinders or by the motor, and at the draw-bar of the tender, separately; also, to have a separate formula for the resistance of the locomotive and the train. A given class of engine hauling at one time a different class of train than at another time, but under otherwise the same conditions as to speed, indicated horse-power and wind resistance, would have the same resistance in and on itself per ton of locomotive and tender, regardless of the class of train behind it, while the resistance of the train would correspond to that of a particular class. Therefore, the simplest and most useful formula is one which applies to but one class of locomotive or one class of train, and there would, or might be, as many formulæ as there are classes of locomotives and trains. The classes of trains for which the resistance is no doubt different in each case are as follows:

Passenger.

- 1st. Special or specific trains.
- 2nd. Sleeper coach trains.
- 3rd. Ordinary parlor and passenger coach trains.  
Freight.
- 4th. Train of coal cars, empty.
- 5th. Train of coal cars loaded.
- 6th. Train of box cars empty.
- 7th. Train of box cars loaded.



The desirability of separate formulae seems apparent when it is considered that the per ton resistance of a given class of train at different speeds gives a curve entirely separate from similarly plotted resistances of another class of train; this is shown in Fig. 1 of the article in question by curves  $W_1$  and  $W_2$ . As the differences in this respect for empty and loaded coal cars are even greater and would show curves relatively farther apart, there seems very little use to complicate matters by lumping everything into one statement.

From a comparison of the results of separate formulae, as suggested, a much better understanding of the general subject could be obtained than from a single lump formula. I should consider the formulae in the article disappointing, inasmuch as they do not separate the train resistance behind the tender from the total cylinder power; also, their derivation is uncertain, and it cannot be judged how much is based on reliable experiments, how much on theoretical assumption and how much on guess.

The curve resistance formula  $\frac{4800}{R-180}$  given by Mr.

von Borries goes to show that the resistance per degree of curvature is, per ton of 2,240 lbs. and per ton of 2,000 lbs., as follows:

—Curve Resistance.—		
	Per 2,240 lbs.	Per 2,000 lbs.
1 degree curve.....	0.86	0.77
2 degree curve.....	0.89	0.80
3 degree curve.....	0.92	0.82
4 degree curve.....	0.96	0.86
5 degree curve.....	1.02	0.92

The figure often used is  $\frac{1}{2}$  pound per ton of 2,000 lbs. per degree of curvature. The above, therefore, gives a result at least 50 per cent. greater for a 1 degree curve, and fully 100 per cent. greater for an 8 degree curve. While this may be suspected as rather high for curve resistance, I am not prepared to dispute the formula. The speed at which a train runs around a curve naturally has a good deal of influence on the curve resistance. At slow speed the wheels hug the lower rail and at high speed the upper rail, and at some intermediate speed the wheels may tend to run more as on a straight track, so that the factor of speed enters to materially affect the resistance due to curvature.

The question of train resistance appears to be as far from a satisfactory solution as ever, and it would seem to be a question which can only be settled by some very careful experimental work. Undoubtedly, it is a question which could well engage the attention of the Master Car Builders' and Master Mechanics' associations, if facilities could be provided for making an extensive series of tests.

S. M. P.

### The Performance and Design of Locomotives.\*

BY A. VON BORRIES.

(Continued from page 21.)

#### III.—TRACTION FROM THE WEIGHT ON DRIVERS.

Traction depends on the friction of the drivers on the rails, and amounts to about one-fifth—on an average one-sixth—of the weight on the drivers when the rails are dry, and one-seventh, or less, when they are damp or covered with leaves, mist, ice, etc. Friction is diminished at sharp curves by the lateral sliding of the wheels, particularly the front ones. In general, the friction of the drivers on the rails can be taken as 335 lbs. per ton (2,000 lbs.) of driving axle load for freight locomotives running on tracks of moderate curvature, and 300 lbs. per ton when on mountain roads, with damp unnelled and sharp curves. The latter can be used also as the average figure for passenger locomotives. These values can be increased as necessity requires by using sand. English locomotives with free driving axles and the American freight locomotive often utilize for traction, so it is claimed, one-fifth of the load on the drivers, but this requires skillful handling to avoid slipping. On street railroads one-eighth only can be depended on because of the usually dirty condition of the rails.

#### IV.—CALCULATION OF THE PRINCIPAL DIMENSIONS.

The principal dimensions for a proposed locomotive are better settled by reference to tabulated dimensions of many approved designs (for tables, see *Eisenbahntechnik*) than by any attempts at calculation founded on theoretical considerations of combustion, evaporation, cut-off, etc., because all such attempts must be based on conditions differing more or less from those of actual practice and therefore furnishing deceptive values.

Every newly projected locomotive is expected to effect either a certain maximum traction  $Z$ , from formula

$$*W = 5.33 + \frac{V^2}{173} + 2.24 S + \frac{4,800}{R-180}, \text{ or, for a given}$$

speed, a certain performance  $\dagger N = \frac{ZV}{375}$ ; that is to say, in

freight service the main consideration is the traction required, while in passenger service it is rather the power developed at a certain speed.

The least weight in tons on the drivers,  $L_1$ , required to

give a traction,  $Z$ , expressed in pounds will be  $Z$  divided by the traction per ton on drivers estimated from numerous examples (see tables aforementioned for  $\frac{Z}{L_1}$ ) and which

occur, approximately, within the following limits:

1. For passenger and high-speed locomotives, from 300 lbs. per ton to 360 lbs. in exceptional cases.

2. For freight locomotives, from 334 lbs. per ton to 360 lbs., also exceptional cases.

In the cases of passenger locomotives, which are destined for heavy grades, and of passenger tank locomotives, which must exert their full traction at frequent intervals and whose weight steadily decreases with the consumption of supplies, 300 lbs. per ton ought not to be exceeded.

The weight  $L_1$ , thus determined is to be divided among the drivers, each driver's load never to exceed a certain amount, which fixes their number. The next thing is to determine the diameter of the drivers.

Section 108 of "Technischen Vereinbarungen" specifies the following maximum piston and driving-wheel speeds:

	Number of coupled axles.		
	1 to 2.	2.	4.
Piston speed in feet per minute.....	1,666	820	636
Revolutions per min. of the drivers	260	260	160

"If the injurious effects of reciprocating motion (*störenden Bewegungen*) be considerably diminished by the design, these figures can be exceeded."

A confusion of the "reciprocating" with the "rolling" motion (*Schlingern*) lies at the basis of this determination, as will be shown later. The latter motion is the only important one to be considered, and is not connected with piston nor driving-wheel speed; for this reason, in the case of all locomotives running at any considerable speed, the above values cannot be successfully used. It would be better to choose wheel diameters whose adaptability has been well established by experience, or find them by the formula  $D'' = 31.2 + .95 V$ ,  $V$  being the average speed in miles per hour. This formula applies very well to locomotives whose axle loads are 14 tons or over. For light locomotives smaller wheels are usually employed.

The revolutions of the driving wheels per second,  $U$ , will be  $5.6 \frac{V}{D}$ .

Before the heating surface can be estimated the method of using the steam, the ratio of heating to grate surface ( $\frac{H}{R}$ ) and the boiler pressure,  $p$ , must be definitely decided.

Concerning the first, little need be said except that, in all cases where the demand on the locomotive is not too irregular and variable, compounding is to be recommended. Therefore for pushers and tank locomotives for freight service single expansion will be preferable, while compound expansion can be applied more profitably to all locomotives destined for regular passenger and freight service.

The ratio  $\frac{H}{R}$  depends upon the engine performance as well as the quality of the fuel to be used. According to the experiments of Chief Engineer Henery of the P., L. & M. Ry., with good coal, maximum evaporation occurred with a ratio of about 50, even though there was then but a moderate combustion of the fuel. For passenger and high speed locomotives or, in general, locomotives which develop great power with a minimum of weight, an average value of 55 can be used; while for freight locomotives 60, or when provided with long boilers even 80 is believed to produce best results. If the fuel is hard lump coal of good quality (lump coal, pressed coal, coke, etc.), which can be burned in thick layers, the grate surface may be smaller, and  $\frac{H}{R} = 60$  to 90. On the other

hand, if it is so fine that a strong blast cannot be maintained, then the grate must be larger, and  $\frac{H}{R} = 23$  to 26.

$p$ , the boiler pressure, is usually about 176 lbs. (12 atm) The higher pressures are much more effective in compound than in ordinary single expansion.

After values of  $U$ ,  $\frac{H}{R}$ ,  $p$  and the method of using the steam have been determined for a given performance,  $n$ , the performance per square foot heating surface, is to be estimated (see last table in II.), when  $H$  can be found by dividing  $N$  by  $n$ . This leads now to the total weight of the locomotive, which depends on the design and for which the ratio  $\frac{H}{L}$  for similar types can be found in the tables (*Eisenbahntechnik*.) The simpler and larger the design and the smaller the drivers the larger  $\frac{H}{L}$ ; the more complex and smaller the design and the larger the drivers the smaller will this ratio be. These relations are particularly noticeable in all the examples of tank locomotives, in which also the storage capacity for supplies has considerable influence.

Dividing  $H$  by the ratio  $\frac{H}{L}$  evidently will give the total weight  $L$ . If  $L$  is larger than  $L_1$ , the least weight on drivers already determined, either the latter must be increased, or if it is impracticable, the truck wheels (*Lauf-*

*achsen*) must be provided. If  $L$  should turn out somewhat smaller than  $L_1$ , then the latter is to be used in the calculation  $H = L_1 \left( \frac{H}{L} \right)$ , and the power developed will be correspondingly increased.

The appropriate sizes of the cylinders can be determined in many cases likewise by reference to the tables.

The stroke,  $h$ , may be from 22 in. to 26.4 in. (550 to 660 mm.) for both main and branch line locomotives; or more specifically, the stroke can be taken as 0.30 to 0.38 of the diameter of driver, for passenger and high-speed locomotives; 0.33 to 0.4 for tank and 0.45 to 0.55 for freight and the smaller locomotives.

The diameter,  $d$ , in inches, of the cylinder is given by the formula

$$d = \sqrt{\frac{Z D}{p_1 h}}$$

or of the high-pressure cylinder in a compound

$$d_1 = \sqrt{\frac{2 Z D}{p_1 h}}$$

in which  $p_1$  is the effective pressure, given as a percentage of the boiler pressure  $p$  in the following table:

	Single expansion.	Double-expansion, when ratio of volumes is		
		1:2 to 2:2	1:2.4 to 2:5	1:2.9 to 3
Pass. and high-speed locos.	0.50	0.42	0.38	0.33
Freight and other locos.	0.60	0.50	0.45	0.385

As these figures have been established by many years actual experience, it renders unnecessary, in this connection, further considerations of the degree of expansion or anything else that pertains to the action of the steam in the cylinders, other than to remark that  $p_1$ , given above, results from a 30 to 40 per cent. cut-off in single expansion and 50 to 60 per cent. in compound. With  $p$  at 176 lbs., the volume-ratio in the latter is 1:2.1 to 2:2 for passenger and 1:2 to 2:1 for freight locomotives; at higher pressures and earlier cut-offs 1:2.4 can be used to better advantage. The ratios 1:2.9 to 1:3 apply to Woolf compounds.

The above formulae may be written in the forms,

$$d = \sqrt{\frac{L_1 D Z}{p_1 h L_1}} \text{ and}$$

$$d_1 = \sqrt{\frac{2 L_1 D Z}{p_1 h L_1}}$$

The size of cylinders for all locomotives, such as freight and passenger working on heavy grades, which utilize for traction the full load on drivers, can consistently be calculated from the traction; and, then, the determination should be based on the maximum traction, for in climbing heavy grades the steam consumption is maximum, and it would therefore be wise to utilize it to the fullest extent. In case the locomotives are destined to passenger service on the level or on easy grades at speeds so high that the effective performance of the boiler ( $nH$ ) is less than  $L_1 \left( \frac{Z}{L_1} \right) \frac{V}{370}$ , the size of cylinder should be considered in its relation to the heating surface, in order that their performances may be accomplished ordinarily with the most efficient steam consumption.

If  $C = \frac{\pi}{4} d^2 h$  is the volume in cubic inches of the cylinder—in compound engines of the high-pressure cylinder—the ratio  $\frac{C}{H}$ , according to experience, should be as follows:

Locomotives.	C : H.	
	Ordinarily	For skillful firing, high pressures and greater expansion.
(1) Pass. and high speed, simple.....	4.27-4.56	10 5.98
2 and 3 coupled..... compound	4.85-5.13	" 5.98
(2) Pass. and high-speed, 2 and 3 coupled.....	5.70-5.98	" 6.27
(3) Freight, depending on simple.....	4.56-5.70	" 5.98
the size of grate, etc., compound	5.70-5.98	" 6.27
(4) Tank passenger..... simple	5.13-5.70	" 6.84
(5) Tank freight..... simple	4.56-5.42	" 7.13
(6) Tank, for branch lines..... simple	4.85-5.13	.....

These values, although given for all locomotives, would be used, as a rule, only in calculations for the locomotives under No. 1. In the other cases they furnish another means of settling the adaptability of the cylinders, which have been determined from considerations of traction alone, to the heating surfaces, and of modifying improper assumptions for  $Z$  and  $V$ . Compound passenger and high-speed locomotives with cylinders not calculated to utilize all the load on drivers, nevertheless, possess means to enable them to exert in starting and upon heavy grades all the traction possible under their loads.

#### V.—WATER AND COAL CONSUMPTION.

According to Lochner's experiments at Erfurt, the water and coal consumption in locomotives of average weight will be about as in the following table.

The values for coal consumption refer to good Westphalian coal, whose evaporative value is 7.5 to 8 (i. e., 7.5 to 8 lbs. water per pound of coal).

The whole work of traction, for any course, is obtained by multiplying the traction  $Z$  estimated for each component section by its length, combining the products reduced to ton-miles. Add to this the work done in acceleration, equal approximately to  $75 GV^2$  ( $G$ , tons

\* These articles are extracts from an important work, "Die Eisenbahn-Technik der Gegenwart," selected and translated for the *Railroad Gazette* by Mr. W. W. Nichols, Instructor in Mechanical Engineering in Yale University. Mr. Von Borries, as very many of our readers know, is Mechanical Chief of the Hanover "Direction" of the Prussian State Railroads. † See page 19.





Tubes number.....	225
outside diameter.....	1 1/8 in.
Heating surface, tubes.....	1,241.3 sq. ft.
firebox.....	1,591 sq. ft.
total.....	2,832.3 sq. ft.
Grate area.....	205 sq. ft.
Tender, weight loaded.....	59,581 lbs.
capacity for water.....	2,600 gals.
fuel.....	3 tons.

### The Illinois Central Improvements at Chicago.

[Concluded from page 57.]

#### The Yard.

The large diagram, Fig. 1, given herewith shows the tracks and buildings in the terminal yard as they existed on Jan. 1, 1898. From the north-

north to Harrison street, and beyond that point they are used by the Michigan Central for through freight to its north yards. Tracks 8 and 9 are suburban express south of Harrison street. These cross the yards obliquely on a No. 9 lead, and are merged with the local suburban tracks 1 and 2, which run through to the throat of Randolph street yards, the north suburban terminus. Tracks 8 and 9 north of Harrison street become freight and local tracks, respectively. Nos. 10 and 11 are local tracks. The four remaining tracks, to the eastward, are used by the Illinois Central exclusively as freight tracks. The traffic through the depressed area from Park Row to Randolph street is very heavy. Records taken at a cross line drawn through the heart of the

grade with furnace slag or limestone ballast, the express suburban tracks receiving the latter kind. A private sewer of ample dimensions, section shown in our former article Fig. 4, threads the right-of-way throughout and discharges into the lake near Park Row. The total cost of depression and redistribution of tracks, including the expense of all transient location of switches and kindred matters, was about \$57,000. This would fix the cost per foot of track at about 78 cents. Certainly an excellent showing under the conditions.

Interlocking signals were contemplated for the yards and crossovers, and estimates were made for a plant with a tower at Harrison street. This plan was nearly settled, when the subject of electric motive power for the suburban trains was taken up. So much that is favorable has developed from the investigation of the merits of electric propulsion, as it may there be applied, that there is scarcely a re-

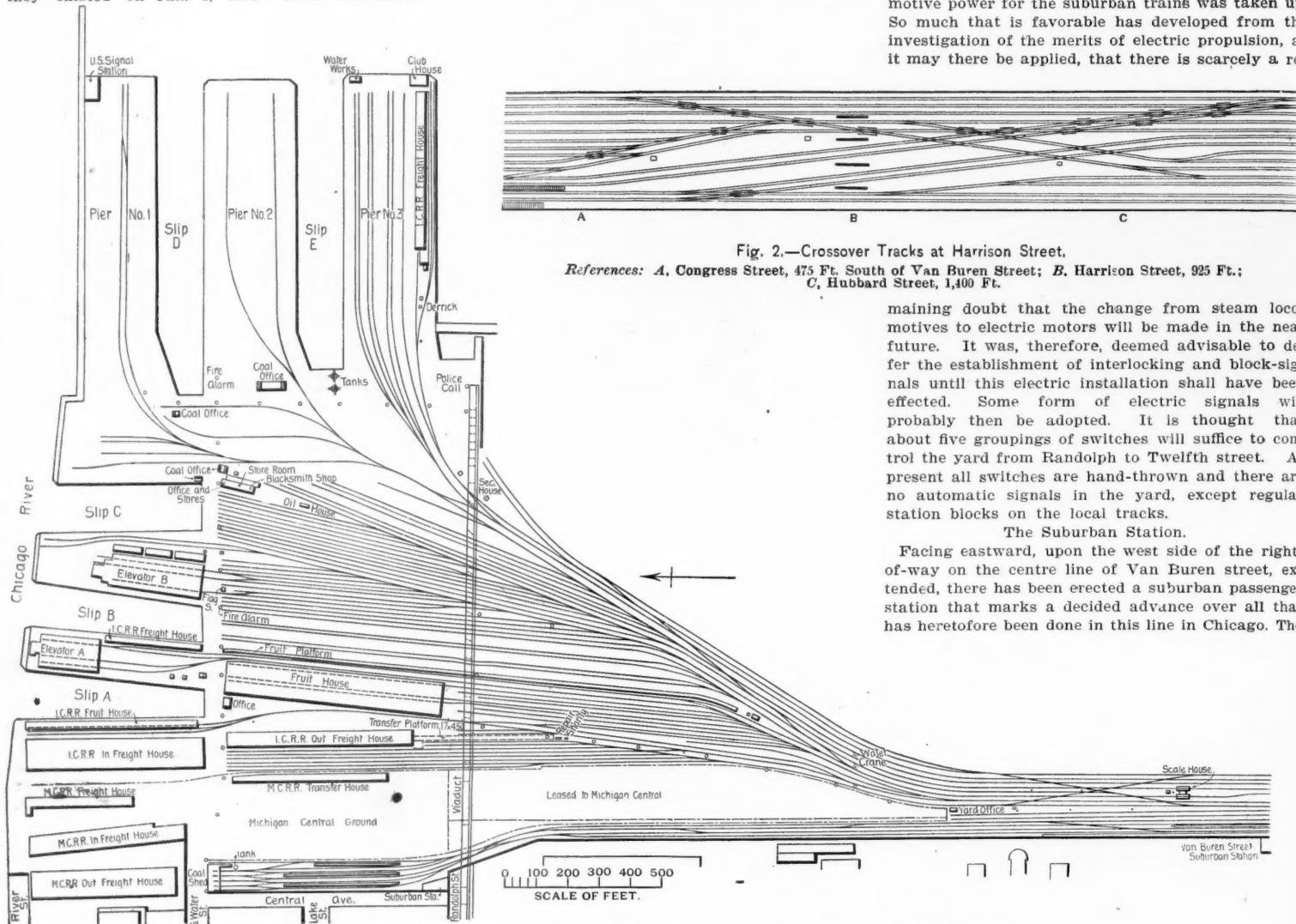


Fig. 1.—Terminal Yards of the Illinois Central Railroad at Randolph and South Water Streets, Chicago.

ern terminus at River street to the Suburban station at Van Buren street (at the extreme right of the drawing) is three-fourths of a mile. The site which was occupied by the old terminal passenger station is at Central avenue, between Randolph and South Water streets. From the yard (Adams street) southward to the Central station, at Twelfth street and Park Row, about two-thirds of a mile, there are, most of the way, 14 tracks. South of Van Buren street station, centering at Harrison street,

yards showed 753 engine movements in 24 hours. This includes all of the miscellaneous traffic of the yards, ranging from empty engines to through freight and foreign "drags," or transfers. No serious impediment to train movements was at any time permitted to arise during the progress of the improvements. The method pursued was as follows: Beginning at both sides of the right-of-way, the initial tracks were depressed and placed fairly in their permanent alignment. This developed sufficient space to allow

station is built within a rectangular enclosure, the east side open, formed by three sides of a 50x100-foot recession in the main retaining wall before mentioned. It is unique in that it is to all intent a subterranean fireproof station, being entirely below the earthline of the park in which it is built, while, having entered from the west approach and passed through it, the passenger emerges upon a platform at a level with the car floor, and wholly above ground as related to the right-of-way at its new

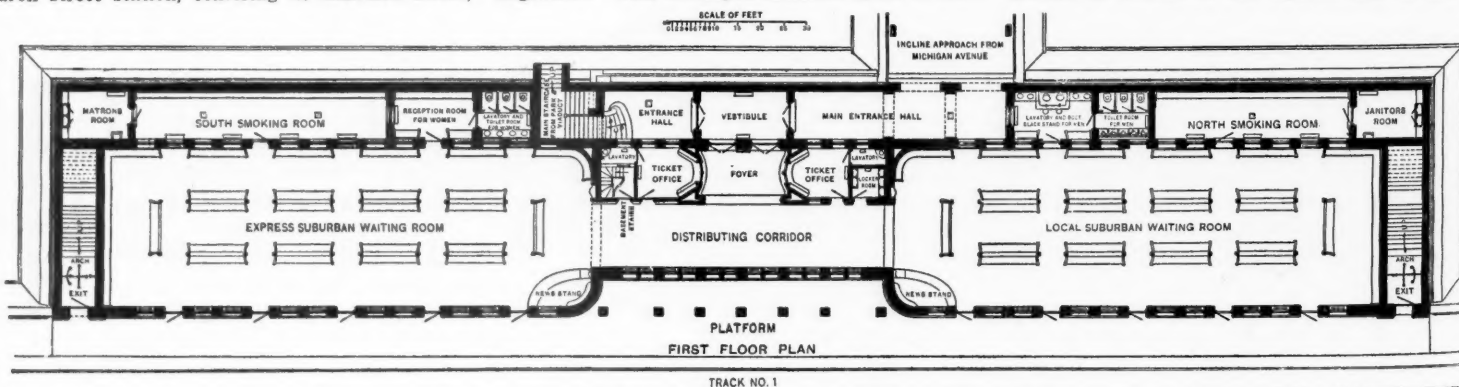


Fig. 3.—Plan of Suburban Passenger Station at Van Buren Street, Chicago—Illinois Central Railroad.

there are double crossovers, as shown in Fig. 2 herewith. (See general location in former article, Fig. 1.) These 14 main tracks are numbered from west to east. Tracks 1 and 2 are for local suburban passenger trains. Tracks 3 and 4 north of Harrison street are for the use of suburban trains in switching. South of that point they are used by through passenger trains for switching to and from the general passenger station at Park Row. Tracks 5 and 6 are Illinois Central through freight

excavation to be made at the sides of the successive tracks toward the centre of the right-of-way, which were, in regular order, in sections of 100 feet, tipped and slid down the resultant embankments without detaching rails from sleepers. The difficulties were augmented by encountering the driven piles upon which the earlier tracks were laid. These piles were dragged out or broken off by locomotives. The tracks were sunk to about 10 in. below their ultimate height, and then brought up to the final

grade. In the central portion of the building there are twenty columns of the Z bar type, supported upon stone-capped concrete piers and concealed as part of the station construction. These columns support that portion of the Van Buren street viaduct that bridges the station, as mentioned in the description of the viaduct, and to them are also attached the adjacent structural parts of the station. Directly beneath this portion of the station there is an ample basement 26x62x7 feet, floored with con-



crete, cement finished. The basement contains a double battery of modern steam boilers for heating, fired by natural gas, either battery being capable of heating the station when the other needs repairs. A Wilkes water heater supplies the several lavatories and mop taps.

The building, as shown in plan and section, Figs. 3 and 4, comprises, in the main, two waiting rooms 34x106 feet, distinguished as "local" and "express." This feature classifies the traffic without confusion on the platforms. The express trains put on during the Columbian Exposition are now a permanent part

These posts are of sufficient height to receive the expiring course of masonry, that runs entirely through the apparently converging lengths of the several courses. These walls withstand the fill of the park that is terraced up to their cope line at either side of the passageway. The passage is spanned near the station by a steel foot bridge incased in terra cotta and stone-trimmed, that connects the north and south sections of the park.

Returning to the station proper, the general style of architecture may be termed Transition Gothic. The frame work is entirely of steel, covered with

bound passengers at the station, it being but one stop removed from the north terminal.

To the interior finish and decorations we cannot attempt to do full justice in an article of this general nature, but some of these features are illustrated in Fig. 6. All main floors are finished in encaustic tile, except the smoking, the janitor's and the matron's rooms, which are of concrete, with ornamental tile borders. The floors of the ticket offices are of maple. The floors of the foyer and vestibule are of high-grade ceramic mosaic of neat design in Gothic pattern. In the floor of the foyer the escutcheon

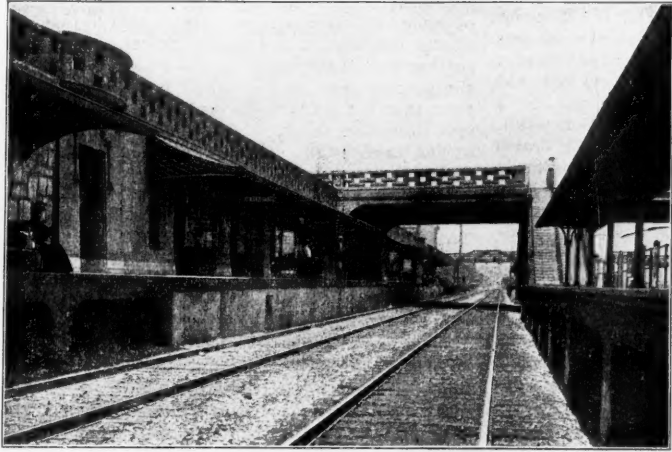


Fig. 5.—Van Buren Street Suburban Passenger Station.

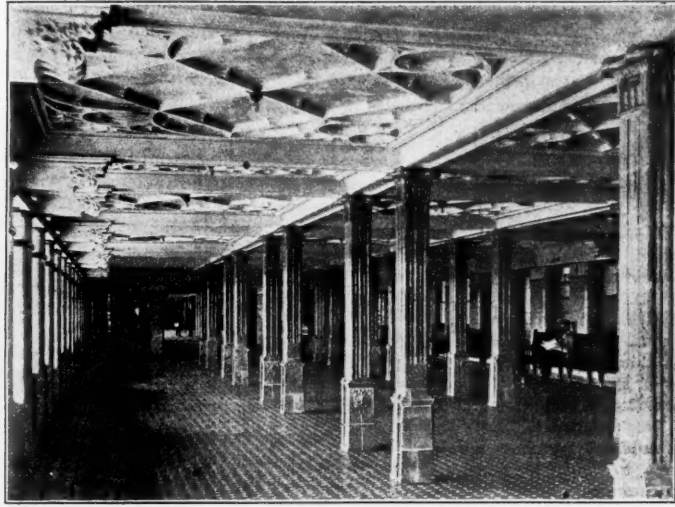


Fig. 6.—Interior of Van Buren Street Suburban Passenger Station.

of the road's service. These trains make no stops south of Jackson street until Hyde Park, Fifty-third street, is reached. The express waiting room is in the south end of the station and the local room in the north. A distributing corridor 14x66 feet connects the two waiting rooms. Opening west from this corridor is a foyer, upon either side of which abuts a ticket office. One of these is used for day and the other for night business, thus keeping the agents' accounts separate. There are two smoking rooms. Two well-appointed toilet rooms are conveniently located, that for women being adjacent to the matron's room at the southwest corner of the express waiting room. There are in addition to the rooms enumerated, lavatories for men, a janitor's room, and special lavatories for the ticket agents. At the north end of the main corridor there is a door opening into clothes lockers; at the south end there is an iron stairway leading to the basement. West of the foyer is the vestibule proper, into which open a north and a south entrance. To the south entrance descends a stairway leading from the park, and also one from the viaduct above\*. This entrance is floored in ceramic mosaic.

The north entrance, a double arch of buff Bedford limestone, is the eastern termination of an inclined approach from Michigan avenue, a plan view of which is afforded in Fig. 4a. This approach is 27 feet 3 inches wide by 235 feet long, and is paved with

fire-proofing. The partition and back walls are of brick. Except where a solid fill of cinders could be made to earth, the floors of concrete are laid upon tile keyed between the steel crossbeams and girders. The roof is made in the same way and covered with Portland cement concrete. A finishing coat of asphalt three inches thick turned into raggles cut into the coping of the roof is in turn covered with rich loam sodded over as an enclosed fragment of the park. This pertains to all of the station's top, excepting ten circular light shafts over the waiting rooms, and that portion of the roof over the smoking and toilet rooms, which is fitted with prismatic lights in cast frames. Provision is here made for ventilation by means of hinged lifts operated from within. The ten ventilating shafts, containing circular sashes of opalescent stained glass at bottom, blend with and are a part of the interior ceiling decoration.

The east elevation or station front, the top of the parapet of which is twenty-six feet above datum, is of buff Bedford limestone, known as oolitic limestone, from its structural resemblance to the roe of a fish. The stone is rub-faced, as is also the block-spaced parapet that surmounts it. The parapet and that portion of the front elevation that is immediately above the exits is elaborately carved. About one-half of the total front area is set apart for glazed surface, so distributed as to favor stock sizes

of the Illinois Central Railroad Company, an elongated diamond, sub-divided, is wrought out in varicolor, and this diamond shape predominates throughout the decorations where it may be consistently employed. The walls in the janitor's, matron's and smoking rooms, in the exits and north and south entrances are of white enameled brick, English size, 3x9 inches. In the other rooms they are to a height of seven feet above the floor line, faced with glazed buff tile 3x6 inches, made by Maw & Co., London, England. Jambs of windows and doors in the rooms where the walls are tile-covered, are made circular to a radius of three inches, woodwork being largely eliminated. This is an innovation in tile interiors introduced here by Mr. Bacon, supervising architect of the Illinois Central, from whose designs, subject to approval, the station was built. These curved tile were made only after great difficulties in burning had been encountered.

As a base-piece for the tile on the walls a slab of chocolate Tennessee marble six inches high is used in all rooms. The ceilings are of white stucco work wrought out in deep relief; the diamond, depressed, before referred to, being the basis of the lines described by the pattern. There are in the two waiting rooms forty cast iron columns five inches in diameter, supporting the roof. These columns are encased in ornamental glazed terra cotta, Gothic also in style. The height of ceilings is 9 feet

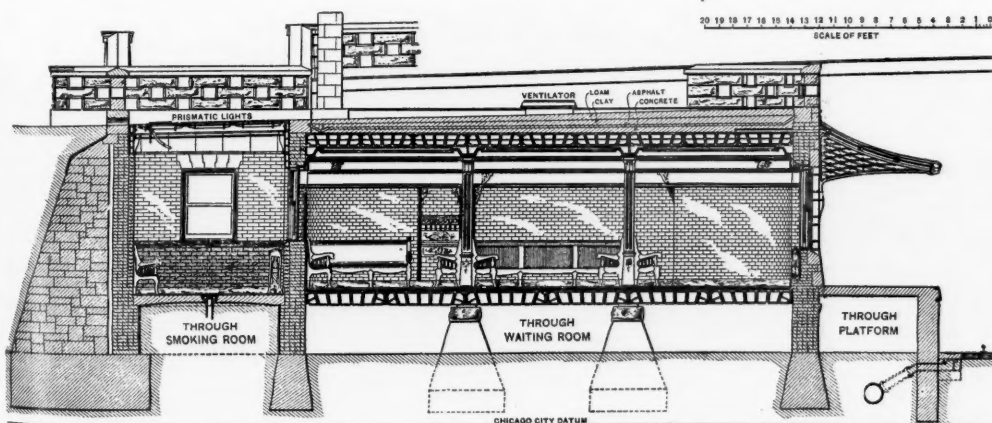


Fig. 4.—Transverse Section Van Buren Street Suburban Passenger Station (Looking North).

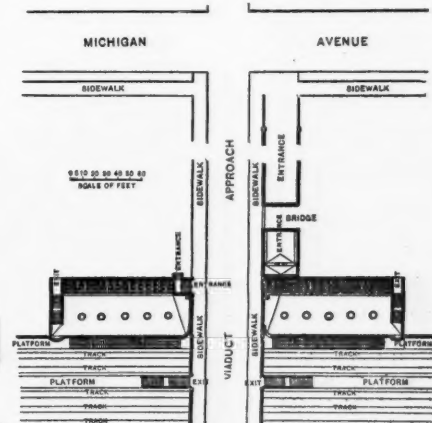


Fig. 4a.—Reduced Plan of Station and Approach.

granitoid concrete, cement finished. The pavement is crowned for drainage from the centre, and has an upward slope of .35 inch to the foot toward Michigan avenue. The passage is flanked at either side by a rock-faced Berea sandstone wall, face batter one-fourth inch to the foot, back batter 1 in 2 1/4, a top slope of three-eighths inch to the foot on the south wall, and five-sixteenths inch to the foot on the north wall. Beginning with a height corresponding to that of the station at their east ends, these walls terminate at Michigan avenue, in ornamental rock-dressed circular posts thirty inches in diameter, and bearing electric lamps at their tops.

\*The viaduct shown in our former article, Fig. 12a, is that at Harrison Street, not Van Buren Street.

of tile in the interior, thus avoiding special cutting of tile.

A granitoid platform 8 feet 6 inches wide runs the full length of the station front at a level with the station and car floors. Steel latticed awnings, with glass covering, curved upward to a radius of nineteen feet, and set in copper trimmings, protect this platform. Iron canopied wooden platforms 250 feet long extend away at either end of the station along the retaining walls. At both the north and south ends of the station a direct exit by stairway to the park above is afforded outside the station. Passengers alighting from northbound trains ascend by stairways from the northbound platforms to the viaduct direct. No provision is made for receiving north-

bound passengers at the station, it being but one stop removed from the north terminal.

The total cost of the building and its approach was about \$100,000. The station was opened for traffic on Dec. 14, 1896. The building was erected under the direction of Mr. George F. Jenkins, master builder for the Illinois Central Railroad. Divisions of the engineering corps in the field at Chicago during construction have been headed by Messrs. A. E. Harvey, L. A. Downs and O. W. Sullivan.

The final adjustment of the Lake Front Park complications has been a theme that actively enlisted the efforts of ex-Mayor George B. Swift, of Chicago. The overtures of the Mayor having been actively met by Mr. J. F. Wallace, M. Am. S. C. E., formerly Chief Engineer of the Illinois Central, and now assistant to the second vice-president. Mr. Wallace planned the work in its entirety and largely represented the officials of the railroad company in the negotiations with the city. The total cost of all the work is estimated at \$1,200,000.

To the gentlemen named, and to Messrs. David Sloan, acting chief engineer, M. Am. S. C. E., and H. W. Parkhurst, M. Am. S. C. E., Engineer of Bridges and Buildings, with their several assistants, who have afforded us ample opportunity for obtaining drawings and data used in these articles, our thanks are due.

#### Fast Run on the Erie.

On Sunday, Feb. 13, a special newspaper train over the Erie Road was run from Jersey City to Buffalo, 423 miles, in 7½ hours, or 450 minutes, equal to 56.4 miles an hour. This far surpasses the run of the preceding Sunday and is the best time ever made over the Erie Road. The time, exclusive of stops, was 426 minutes, equal to 59.6 miles an hour. The train left Jersey City at 3:18 a. m. and arrived in Buffalo at 10:48. The time from Jersey City to Port Jervis, 86 miles, was 90 minutes; from Port Jervis to Susquehanna, 104 miles, 113 minutes; Susquehanna to Hornellsville, 140 miles, 141 minutes; Hornellsville to Buffalo, 93 miles, 95 minutes. The excellent run from Susquehanna to Hornellsville was made in spite of a delay at Elmira to leave a car on which the journals became heated. The train left Jersey City with three cars. The four division runs just noted were made by engines 374, 343, 500 and 479. The first two have 68 in. driving wheels, the third 74 in. and the fourth 68 in. wheels. The first and second engines traversed the hardest part of the road, the second one, especially, having a very crooked division, as well as steep grades. The first made its run at an average speed of 57.5 miles (no stops); the second made 55.2, including one stop of three minutes. The third engine covered its 140-mile division at the rate of 59.6 miles an hour, including one stop of two minutes and one of three minutes. The fourth engine made 58.7 miles an hour, including a stop of five minutes for water. This last division has the most favorable grades westward, but it also includes the Buffalo terminal yards, where speed has to be reduced. The average speeds accomplished by the four engines, exclusive of stops, were, respectively, 57.51, 56.83, 61.65, 61.65.

We append a comparison with fast runs on a few other roads, taking distances most nearly equal to those traversed by the Erie train. It is to be remembered that conditions vary greatly on the different roads. For instance, the New York Central has separate tracks for freight trains, and has few bad curves or grades; the Lake Shore is exceptionally free from grades and curves; the Union Pacific runs, though on a single track line, were over grades almost uniformly level on descending:

	Miles.	Rate.	
		Inc. Stops.	Excl. Stops.
Erie, 1898.....	93	58.70	61.65
" " " " " " " "	423	56.63	59.00
New York Central, September, 1895.....	146	65.75	65.75
" " " " " " " "	436	63.54	64.22
Lake Shore, October, 1895.....	83	66.89	72.92
" " " " " " " "	423	64.45	66.89
Union Pacific, 1897.....	170	65.60	65.00
" " " " " " " "	261	55.70	62.50
London & N. W. (to Aberdeen), August, 1895.....	540	63.24	63.93

#### The Ferracute Press P4.

The Ferracute Machine Co., of Bridgeton, N. J., makers of presses, dies and other sheet metal machinery, make a specialty of a number of presses for railroad shops. The most popular of these for general work is "Press P4." It is a massive and well-designed machine, exerting a pressure of 52 tons, the weight of it being about 4,800 pounds. It is provided with a clutch, so arranged that it stops automatically at the top of the stroke, the operator having merely to touch the toe-treadle in order to make one stroke, or it can be run continuously by locking the treadle down. The clutch is provided with safety lock, so that the operator can set dies, etc., without removing belt. There are also a self-oiling arrangement for the fly wheel and a number of other improvements.

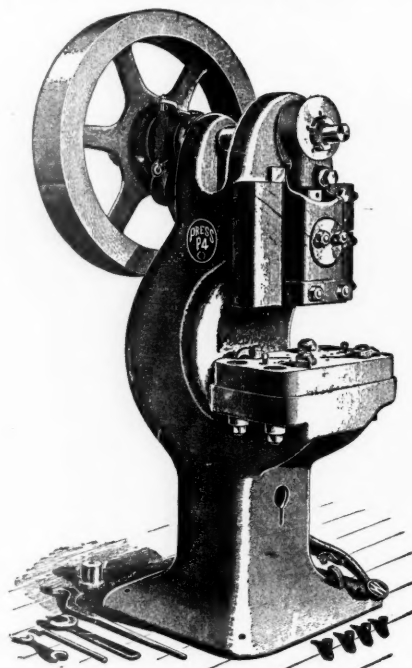
In order to use it for the various kinds of work for which it is required it has a long adjustment of ram and ample room on the bed, and a greater amount of height from bed to ram than is usually found in such presses. The regular stroke is 1½ in., but it can be provided with an extra long stroke by having a special eccentric and pitman strap, so that it can be used for bending and forming work, etc., the maximum stroke being about 4 in. It is fitted up with forged steel shaft, hardened bolts and nuts, drop forged wrenches, etc., and is carefully and accurately built.

#### New Fireproof Warehouse at Chicago.

Contracts have recently been let at Chicago for a new fifteen-story warehouse for Mr. John Druecker, at 111 to 125 Canal street, work on the foundations having already been commenced. The location has great advantages for warehouse purposes, as the property extends through to the widest and deepest part of the North Branch of the Chicago River, just north of the junction of the North and South branches.

The building will rest on Norway piles driven to hard pan clay, the piles being the longest yet driven in Chicago, 35 ft., and cut off not less than 5 ft. below the surface of the river. From this point the dimension stone foundations are carried to the basement floor line. The construction is to be strictly fireproof throughout, and no wood will be used in any part of the building. The frame work will be of steel encased in a fireproof covering of cinder concrete, a protection devised and patented by the architect, Frank B. Abbott, of Chicago. The steel will be protected by at least three inches of concrete at all points, and the columns will be filled in internally, as well as externally, with the same material. The floors will be cinder concrete in which the beams will be entirely enveloped, and the wearing surface of the floors will be Portland cement and crushed granite. The outer or weather covering of the external columns will be hollow bricks. No tile will be used in the building, excepting in the elevator enclosures. All window frames and sashes will be iron, and window glass will have wire embedded in it to prevent breaking if exposed to heat. The roof, like the floors, will be concrete with weather covering.

As the method of fireproofing to be used excludes air from the steel, it is expected that it will save the metal from rust as well as from the effects of heat. Where



Ferracute Press P4.

tile or terra cotta are used there are air spaces along the beams and columns, which recent investigation has shown are promoters of corrosion, the painting of structural steel being but a short-lived protection.

The building will be equipped with three high-speed freight elevators and electric lights. The west front will have rolling steel doors through which freight will be handled directly from cars to the floor. The east front will have similar doors opening on the river, through which freight will be handled from vessels. Deeply laden boats will unload into the basement and lighter laden vessels to the first floor.

Contracts for the foundation work have been let to the Chicago Star Construction & Dredging Co.; for the masonry to A. Lund, and for the structural steel work to the Milwaukee Bridge & Iron Co. The cost of the building when finished will be \$800,000, and it is expected that 100 ft. of frontage will be completed by May 1 next.

#### The Case of the Cast Iron Pipe Agreement.

On Monday of this week a decision was rendered in the United States Circuit Court of Appeals for the Sixth Circuit, which appears to be important as defining the scope of the Federal Anti Trust Act of 1890. Justice Harlan, of the United States Supreme Court, and Circuit Judges Taft and Lurton heard the case. The opinion was written by Judge Taft. The suit was brought by the United States against six companies making cast iron pipe, namely, the Addyston Pipe & Steel Co., Dennis Long & Co., the Chattanooga Foundry & Pipe Works, South Pittsburg Pipe Works, the Anniston Pipe & Foundry Co., and the Howard Harrison Iron Co. An injunction was sought restraining these companies from carrying out the purposes of a contract which they had entered into

controlling an important part of the trade in cast iron pipes. They controlled completely the cast iron pipe market in a large territory and influenced it elsewhere in the United States. Under this contract the country was divided into "free" and "pay" territory. In the free territory each party to this agreement could sell at his own price without considering the other parties. This territory embraced New York, Pennsylvania and Virginia and all States north and east of them. In the pay territory, embracing all the rest of the United States, orders received were submitted to a central board which fixed the price and assigned the order to that one of the associates which would agree to pay to the others the highest bonus.

In the Court of Appeals decision it is held that the agreement is void in common law because of restraint of trade and attempted monopoly; this is regardless of the question of reasonable prices. It was held further that the prices were not reasonable and that the purpose was an attempted monopoly, and further, that the trade restrained under the agreement was interstate trade; and finally that the contract of the association was a restraint and burden on interstate commerce and a violation of the Federal Anti Trust Law, and should be enjoined.

The Circuit Court had dismissed the original bill. The United States appealed from this and the appeal was argued last May by Mr. Edward B. Whitney, then Assistant Attorney General of the United States. In the argument it was maintained that the combination was in violation of the Anti Trust law and that it could be shown to be unlawful at common law. Both of these contentions are supported by the decision now rendered.

We shall attempt no comment on this important case until we see the opinion of the Court.

#### A Possible Track Laboratory.\*

A question of great importance is that relating to the recruiting of men who are to serve as the future heads of maintenance-of-way departments. I have no hesitation in saying that the motive power departments are able to command the best material the country affords, from which to make its men. Graduates of technical schools are willing to take any position which the motive power departments offer. They prize the opportunity to go into the shops, and are glad to take the time there for an apprenticeship, for they know that by such a process they will get the training which may eventually result in their becoming the best informed men in their department.

Such a condition does not exist, unless my observation deceives me, in the track department. Why do not the graduates of the civil engineering department of our colleges take low positions in the maintenance-of-way-department of railroads, just as the graduates of the mechanical engineering department take low positions in the motive department? There are doubtless many reasons which could be given. I will attempt to supply but one.

In training students in mechanical engineering, considerable emphasis has, in later years, been given to laboratory work. Students are trained in processes of manipulation, and in the more expert operations of testing. They work in shops, operate machines and determine the performance of engines. By such means they are taught to understand the breadth of the problems which confront them. Their eyes are opened to the fact that there are no small things; that details which unilluminated by such training would seem insignificant, become large problems when they are better seen. In other words, we are training our students in mechanical engineering so well that they are willing, upon graduation, to begin at the very bottom of the business. That may seem a queer statement, but it implies progress, nevertheless. They will not stay at the bottom. Moreover, the result is one which is to be credited to the laboratory.

Now, have we not reached a point where technical schools, sending men to maintenance-of-way departments, need to have a track laboratory? I do not mean a 4x9 room with a roof over it, but a model standard gage track that will reach out across the country for a mile or more, with tangents and curves, cuts and fills, and levels and grades. Such a track might be divided into units of 200 or 300 feet in length; each unit to have certain typical characteristics. Thus, one unit could have stone ballast, another gravel, another prairie mud, and another gumbo. Again, different units could represent different standards which are employed to regulate ballast distribution and in the maintenance of slopes and of ditches. Again, different units could represent different weights, sections and lengths of rails, also different qualities of wooden ties, and different forms of metal ties. Splice-bars, different forms of splice-bolts and lock-nuts, of tie-plates and rail-braces, and of frogs and crossings, could all have a place under a systematic arrangement, and even switches and signals could be added to further embellish the outfit. The plan should be so comprehensive as to embrace, not American practice alone, but

\*Remarks of Prof. W. F. M. Goss at the January meeting of the Western Railway Club.



the practice of typical foreign roads as well, and it might also be made to represent the historical development of track.

But whatever be the details, such a track, constructed after a well-studied plan, would serve students in civil engineering precisely as a steam engineering laboratory now serves students in mechanical engineering. It would illustrate the limits of modern practice, and would be a means by which a large amount of experimental work could be done. With such a track at his disposal, an enthusiastic and far-sighted instructor, aided by a reasonable amount of track labor, could assign problems and outline questions of research, in the solution of which the student would be shown the breadth of problems which are now presenting themselves in the maintenance of the tracks of our country. He would apprehend their significance and, when out of school he would be willing to take any position on the track, however low at the start, for he would feel that his chosen field would be sufficiently broad to receive all the skill and energy which he could possibly command for its development.

### Coil Springs for Freight Cars.\*

From past experience it has been clearly demonstrated that of the various sections of bars used in making coil springs, no form has been found as efficient and successful in every way for freight car service as the round bar.

In addition to the opinion that the round bar has been the most satisfactory, the scrap piles on the various railroads strongly emphasize this fact and we do not consider, therefore, that there is any argument to the contrary on this point. Our recommendations consequently will only provide for the use of round bars.

Your committee believes that a great saving can be effected by the standardizing of this part of the freight car truck. We have, therefore, endeavored to reduce the variety of sizes to the lowest possible number to meet the requirements of cars with capacities varying from 40,000 lbs. to 100,000 lbs.

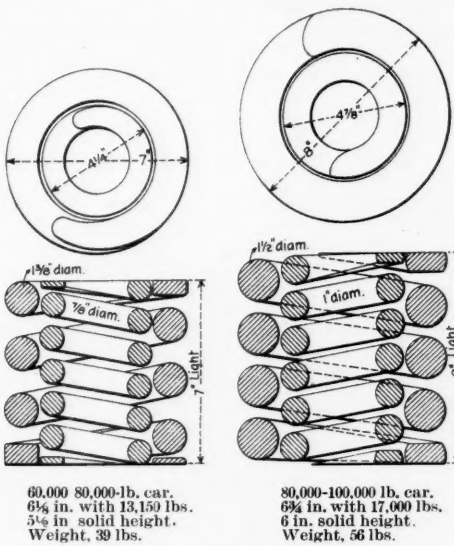
In taking this work up, the committee was confronted with the following conditions:

1. Spring space in trucks of the various railroads.
2. The question of determining the type of spring best suited, from an economical standpoint, and the effect in wear and tear on trucks and bodies under varying load.
3. The least number of sizes of coils suitable for the greatest variety of cars.

**Spring Space.**—We have found in the examination of cars belonging to one hundred or more different railroads that the width of spring space in the diamond type of trucks varied from 10½ to 14 in. on cars of 40,000, 50,000 and 60,000 lbs. capacity. A very large percentage of cars examined had spring space of 11 in. and over. We therefore considered it necessary to provide a spring for a 11-in. space. It was found that for cars of 50,000 lbs. capacity and under the space between spring plank and bolster on diamond type of truck was 6 in., and that a spring of this height for cars named would meet the requirements of the largest percentage of cars in service. For cars of 60,000 lbs. capacity, 7 in. was found to be the best suited dimension, and for cars of 70,000 lbs. capacity and over 9 in. in height was established as the most satisfactory.

capacity, with same type of trucks, the spring should be within the limits of 7 in. in height and 11 in. in width, and for cars of 70,000 lbs. capacity and over, with same type of truck, the spring should be within limits of 9 in. in height and 11 in. in width. In the pedestal type of trucks for cars of 60,000 lbs. capacity the limit of spring space is found to be practically 7 in. in height and 7 in. in diameter, and for same type of truck for 90,000 to 100,000 lbs. capacity, 8 in. in height and 8 in. in width is found to be the present limits.

**Type of Spring.**—It has been developed in the inves-



Springs for Pedestal Type of Truck.

tigations that a single coil spring of the four-group type, of dimensions suitable to the spring space, previously referred to, will meet all the requirements in service of cars of 100 000 lbs. capacity and under and will be the most economical spring for diamond type of truck.

For cars over 60,000 lbs. capacity with diamond type of truck, it has been found that in one case, especially, springs are in use having a greater number of coils than we recommend. This necessitates long spring plates to accommodate increased number of springs in a group, which we consider very objectionable, as the load is then carried at a point on the spring plank that we consider undesirable.

Although we find a number of graduated springs in use, the single coil, not graduated, is the type of spring in general use. This is obvious from an economical standpoint and from the fact that a properly designed single coil spring produces substantially as good results, inasmuch as the compression of the outer coil of a graduated spring when car is empty, or partially loaded, is practically the same as in the case of a single coil. The single coil spring arranged in groups when properly designed, having sufficient motion to avoid closing solid, will carry the load with less vibrations than the graduated spring, for the reason that the limited diameter of inner coil of graduated spring will not

adoption, except where the limited spring space precludes the use of single coil for greater capacities, as in the case of pedestal form of trucks, where double-coil springs are at present generally used.

**Sizes.**—It was determined that a great reduction of the number of sizes of coils and bars could be made. The possible economy in this respect is apparent. It was deemed wise to establish a uniform size of spring plate for the four-group type for diamond trucks. This can be accomplished by increasing diameter of bar and lengthening spring to secure sufficient motion for the various capacities of cars with diamond type of truck. We would therefore recommend for diamond type of truck a four-group single coil spring with spring plates of pressed steel or malleable iron, the latter being shown on blue prints for 40,000 to 60,000 lbs. capacity cars, and it can be used when preferred to pressed steel. Plates to be of uniform size for the various capacities of cars, and of dimensions as shown on the blue prints submitted. For pedestal type of trucks, double coil springs, as shown on blue prints:

**Summary of Recommendations.**—Single coil springs of four-group type for cars of 40,000 to 50,000 lbs. capacity adapted to diamond type of trucks.

Single coil springs of four-group type for 60,000 lbs. capacity cars for diamond type of truck.

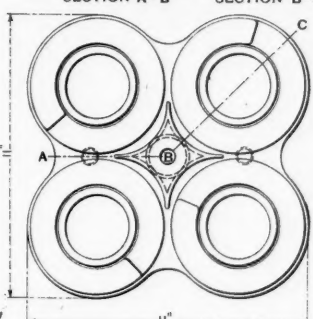
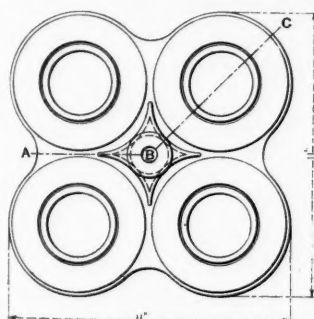
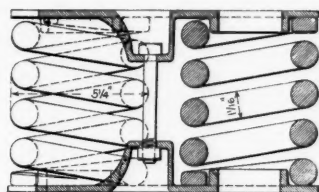
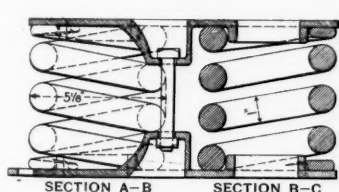
Single coil springs of four-group type for cars of 70,000 to 90,000 lbs. capacity for diamond type of trucks.

Single coil springs of four-group type for cars of 90,000 to 100,000 lbs. capacity for diamond type of truck.

Double coil springs adapted to pedestal form of truck for cars of 60,000 to 80,000 lbs. capacity.

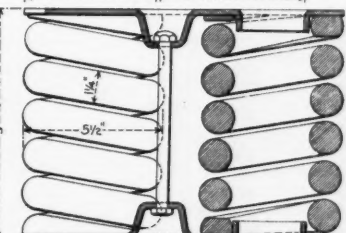
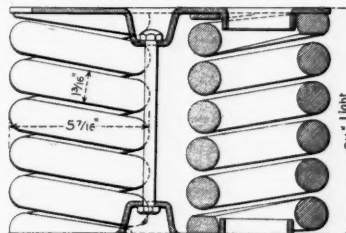
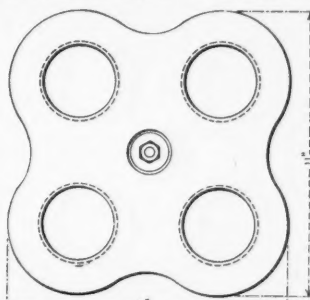
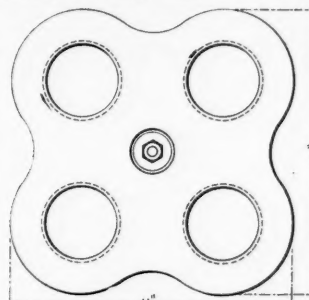
Double coil spring adapted to pedestal form of truck for cars of 90,000 to 100,000 lbs. capacity.

**The Steel.**—The character of steel used in springs is fully as important as the shape of the bar; as otherwise one of two conditions develop, viz., broken coils or springs taking a permanent set, both of which are serious objections. Broken springs, however, are of course readily observed and can be removed. Springs that have taken a permanent set are not readily discovered and are to a very great extent unnoticed, and under maximum load they will become solid under varying speed and condition of track, and under these conditions they will transmit blows to the axle that materially shorten the life of the axle, resulting ultimately in the breakage of many axles, for which no special cause can be assigned, and in addition these blows seriously affect archbars and other important parts of trucks. This condition is developing more rapidly and becoming a more dangerous element in freight-car trucks than it has at any time in the past, for the reason of the rapid increase in the number of freight cars of 60,000 lbs. capacity and over. The older forms of spring for 40,000 and 50,000 lbs. capacity cars have a larger margin of strength than is the case generally with springs for cars of 60,000 lbs. capacity and greater. This clearly emphasizes the necessity of more care in the use of proper grade of steel for coil springs than is now practised, as by the use of steel that can be considered ordinarily of a cheaper grade a permanent set in the spring will certainly follow. Hence we consider that a disregard of the composition of the steel is a more dangerous element than a violation of well known and established principles in the form and size of spring. In view of this fact we will recommend an analysis that has been found to produce the most satisfactory results, which should be observed as a



40,000-50,000-lb. car.—Diamond Truck.  
5½ in. with 16,000 lbs.  
4½ in. solid height.  
Weight, 48 lbs. per group.

60,000-lb. car.—Diamond Truck.  
6½ in. with 20,000 lbs.  
5½ in. solid height.  
Weight, 60 lbs. per group.



70,000-90,000 lb. car.  
7½ in. with 29,600 lbs.  
6½ in. solid height.  
Weight, 92 lbs. per group.

90,000-100,000-lb. car.  
8 in. with 36,000 lbs.  
7½ in. solid height.  
Weight, 103 lbs. per group.

Bolster Springs for Diamond Trucks.

[Committee of Central Railway Club.]

It will, therefore, be seen that for cars having diamond type of truck, with capacity of 40,000 to 50,000 lbs., a spring within the limits of 6 in. in height and 11 in. in width will be best suited, and for cars of 60,000 lbs.

absorb the shocks with the same smoothness of motion as is possible with a larger diameter, as is the case in the single coil spring of larger diameter, which are not affected by the motion of smaller coils. It will, therefore, be seen that with a well-designed single coil spring, made from proper grade of steel, good results at a minimum expense can be secured, which advantages would be sufficiently attractive to recommend it for general

standard in connection with the form of spring shown on blue print herewith submitted.

**Specifications.**—Manufacturers must furnish one extra spring for chemical test when desired by purchaser in each lot of 100 springs purchased. If a piece is cut off of sample spring for test, care should be taken, if cut off hot, in cooling to avoid hardening it. Sample spring for chemical test to be selected by purchaser.

\*A report to the Central Railway Club by Messrs. H. C. McCarty, General Car Inspector Northern Central; H. F. Ball, General Car Inspector Lake Shore & Michigan Southern, and J. R. Petrie, Chief Joint Car Inspector, Buffalo.



The metal desired for spring is steel of the following composition:

Carbon.....	1.00 per cent.
Manganese.....	0.25 " "
Phosphorus not above.....	0.05 " "
Silicon not above.....	0.10 " "
Sulphur.....	0.03 " "

An analysis will be made in accordance with the usual chemical methods of the samples sent for chemical test, as above described, and in case the carbon is found to be below 0.90 per cent., the manganese above 0.40 and the phosphorus above 0.06, the spring represented by the sample will, at the option of the purchaser, be returned to the makers, or retained and used at an agreed upon deduction. The right is reserved of taking the borings for analysis from any part of the coil, it being understood that manufacturer may at any time within three weeks after analysis is made claim a part of borings used for purpose of verification.

#### Business Problems of the Motive Power Department.\*

Engineering problems are closely interwoven with considerations of a commercial nature, and the conduct of a motive power department of a large railroad system forms no exception to this rule. The end for which the department was created is of course that of keeping the wheels turning, but as one of many departments it is necessary to make its work fit into the needs of the others, and to so conduct its own affairs as to bring them in harmony with the aims and resources of the organization as a whole. This might properly be designated as the grand business problem of the motive power department.

Before turning to the problems within the department it may be well to give some idea of its expenses from which to judge of the magnitude of its problems. The average cost of locomotives may be placed at \$9,000, while the average capital expenditure per locomotive for roundhouses, shops, tools, etc., is in the neighborhood of \$5,000. Thus each locomotive and the equipment necessary to take care of it represents an approximate expenditure of \$14,000.

We will also assume that an engine runs 26 miles to a ton of coal and makes 36,000 miles per year; then the cost of fuel per annum, at \$1.75 per ton, will be \$2,423. The wages of the engineer and fireman will average about 6.2 cents a mile, and all round house labor will average about 1.4 cents per mile or a total for labor of 7.6 cents a mile, or \$2,736 a year. The oil and waste will cost about 0.2 of a cent a mile, or \$72 a year. The repairs and supplies will cost approximately 4 cents a mile, or a total of \$1,440 a year. The cost of water we will estimate 0.2 cents a mile, or \$72 a year; we thus find the several items of "cost of operation" to aggregate \$6,743, exclusive of all interest charges on capital employed.

It is not unusual for large railroad systems to possess 500 locomotives and quite a number of them own more than 1,000. From the above figures it will be seen that the operation of 500 locomotives calls for an average expenditure, through the mechanical department, of \$3,371,500, and for 1,000 engines the sum becomes \$6,743,000 per year. It is therefore needless to say that in the expenditure of such large sums as these and the treatment of a portion of the company's business so important and having such an important bearing on its interests, every problem, no matter what its character, has its business side as distinguished from its narrower or purely technical nature.

The motive power official must consider the locomotive as a tool, representing a large investment of capital and costing annually a considerable sum for its operation, and must be mostly concerned in making it give the largest possible return to the company. If to attain this end he must violate, in the construction or operation of the engine, principles which he knows tend toward economy of water and fuel, it is his business to do it. And I have no hesitation in saying that to the carrying out of this business-like policy are due some features of locomotive practice that are sometimes condemned by those who look upon the subject entirely from the standpoint of economy in fuel.

Tests that have been made upon the locomotive in the laboratory of Purdue University demonstrate that the most economical point of cut-off is between one-quarter and one-third of the stroke. Other tests made on the same plant show that as the locomotive boiler is forced and the rate of combustion increased, the rate of evaporation falls off rapidly. The conclusion is therefore warranted that with a given speed a cut-off later than one-third of the stroke will result in a loss of economy, both in the boiler and the cylinders. The work of the engine varies so much with the grades that we cannot expect to run at a uniform rate of cut-off, but is it economy to endeavor to give the locomotive such a load that it will average one-quarter to one-third cut-off?

Suppose a 19-inch engine in freight service on a

\*Extracts from a lecture delivered at Purdue University by Mr. Robert Quayle, Superintendent of Motive Power and Machinery, Chicago & Northwestern Ry.

hilly division, and that under a limitation of the average cut-off to one-third, it can haul over the division 600 tons, exclusive of its own weight and that of the way car. Let us further assume that if the engine is worked to its utmost capacity on the ruling grades, we shall be able to haul 750 tons. The train and engine crew's wages will amount to about 13.2 cents a mile, or \$13.20 per one hundred miles. When hauling the heavier train we are getting 25 per cent. more tonnage over the division for the same cost in wages, and thereby effecting a saving of \$3.30 for each hundred miles the 750 tons are hauled. This a clear gain in operating expenses.

Now, let us look at the actual consumption of fuel and, in doing this we must bear in mind that while our nominal weights of trains are 600 tons and 750 tons, respectively, the real weights, allowing 100 tons for the engine and tender and 15 tons for the way car, are 715 and 865 tons respectively.

Evidently the weights of the engine, tender and way car form a fixed quantity in the calculation and the heavier the train the less the percentage of the total work of the engine needed to overcome their resistance, and the internal resistance of the engine. Evidently the coal consumption in our comparison should be figured on the basis of the tonnage of the cars and their contents only, for upon this are based the earnings of the train.

For the 600-ton train the coal consumption may be taken at 17 pounds of coal per hundred ton-miles, or 10,200 pounds to haul the train one hundred miles. For the 750-ton train the consumption per hundred ton-miles will be about 1½ pounds less, or say 15.5 pounds per hundred ton-miles. In other words the lesser percentage of the total work of the engine expended upon itself, its tender and the way car, more than offsets the increased consumption of coal per indicated horse power. The total consumption for the 750 tons hauled one hundred miles will be about 11,625 pounds. Thus while the total consumption of coal per trip is greater for the heavier train the consumption per hundred ton miles is less. Consequently the fuel bill to haul three thousand tons of cars and contents will be less if it is taken over the road in four trains of 750 tons instead of five trains of 600 tons. So we have saved money in both wages and fuel per hundred ton miles.

But the question is broader still. Evidently fewer engines resulting in a lesser investment are required; furthermore, while the cost of repairs per mile run by the engine may be greater, the cost per hundred ton-miles of train hauled will be less. Again, the fewer engines will mean a smaller investment in round houses, shops, machinery, etc., and last, but not least, the operating expenses will be reduced in more ways than train crew wages, and the liability of accident will be lessened by the fewer number of trains. Thus the broader the light in which this question is viewed the greater the economy of working the locomotive beyond the point of maximum economy per indicated horse power.

The road with which the writer is connected keeps an individual coal record, by which the consumption of coal per hundred ton-miles by each engineer is recorded. In a group of men in comparable freight service on one division the best performance, in November last, was 15.9 pounds per hundred ton-miles, the engineer having an average train of 853 tons. The poorest record was 28.7 pounds, but the average train was only 378 tons. Of course there are difference in engines, which was true in this case, but all our coal accounts support the statement that other things being equal, the heavier the train, the less the consumption per hundred ton-miles. The limit to this rule is not reached before the engine is so overloaded that the required time cannot be made; so evident is this to our engineers that they are anxious to haul the heaviest trains of which their engines are capable, as by this means only will their records compare favorably with others in the same class of work.

On this basis the size of locomotives has been constantly increasing and will continue to increase. Anything which adds to the economy of performance but limits the amount of work that can be obtained from the engine, either by reducing the tonnage it can haul per trip or reducing the mileage it can make per year, cannot hope to succeed. If a complicated valve gear would save five or ten per cent. in fuel, but would cause the engine to miss a trip occasionally because of repairs necessary to the mechanism, the loss of the service of the engine to the company in busy seasons would possibly more than offset the saving in fuel. On the other hand, simple, strong, and reliable construction of the locomotive, facilities for quickly repairing it, and everything that will add to its useful mileage per year, is worthy of careful study.

As most of our large railroad systems have reached their present size by the consolidation and absorption of smaller lines, each of which, when independent, had shops of its own, it is not surprising to find a system provided with many shops, more or less completely equipped for doing the work of general repairs, and yet not one of them with all the facilities for doing work cheaply and on a large

scale. To effect a reduction we must have improved machinery and up-to-date methods. But much of this machinery, if installed in a small shop, would be idle most of the time; so, in many cases, in might not pay to purchase new machinery unless more work can be found for it. By concentrating the heavy work at a few places the maximum economy can be obtained with the minimum capital invested in tools. The introduction of improved machinery and methods must go hand in hand with a concentration of the class or classes of work affected thereby. Nothing is more certain than the need of modern methods and first class machinery in railroad shops; from this it follows that concentration of work must be accomplished, at least to the extent of keeping it properly employed.

This leads us to turn out attention to the small shops on the various divisions with a view to deciding how much of the work performed in them can be profitably transferred to the larger and better equipped shops. We may find that with proper round house facilities for making the running repairs, some of them can be closed entirely. In such cases we gain not only the benefit of a lower cost of the work thus transferred to a better equipped shop, but we save in such items as light, heat, power, superintendence, etc. As superintendence itself is a large item, amounting to about ten per cent. of the total expenses of the department, the saving in this direction is considerable. There will still remain, however, numerous shops that must be maintained and in which certain classes of repairs can be as cheaply done as in the main shops. It will be found economical, nevertheless, to take from them the heaviest classes of repair work, and also to relieve them of the manufacturing of much of the standard materials. The main shops should undertake to make on a large scale as many of the new parts required in repairs over the entire system as the conditions will admit of, and this work should be done upon a manufacturing basis, so far as practicable. By this means the cost is reduced and there is every incentive to keep on cheapening the work and raising the quality of it by special and ingenious methods.

To carry out this policy, two things are necessary, a standardizing of the parts of the various locomotives owned by the company, and liberal appropriations for the machinery needed in the work.

To show the need that may exist for standardizing and what can be accomplished, I will quote a few of the results obtained along this line in the motive power department with which I am connected. We have reduced to one or two sizes most of our cocks and valves, oil cups, injector checks, glands and all other brass work and small parts. At one time we had 113 different kinds of cabs on the 1,010 engines owned by the company; now the number has been reduced to nine. Pilots at one time were built of 15 different heights; now there are but three. The number of kinds and sizes of smoke stacks have been reduced from legion to four. Two patterns of exhaust pipes have replaced 45 old ones. Ten crosshead patterns take the place of 20 formerly used. The standard eccentrics take the place of 11 needed heretofore. Sixteen cylinder-head castings and seven cylinder-head patterns have been discarded, also six steam chests and casings. Six standard wheel centers now take the place 22 formerly used. And so I might go through the entire list, but those already mentioned are enough to indicate the great saving that can be accomplished both in the stocks carried and the cost of production. Not a week passes without seeing more of this work accomplished and yet in it all one must be constantly on the alert for improvements and must not hold these standards too sacred.

The roundhouses also may have been originally located with reference to the needs of the short lines and the practice of having locomotive runs average but little more than 100 miles; these houses may all be in use. Every such point involves expenditures for superintendence, etc., and the smaller the number of locomotives handled at a given point the higher the ratio of these expenditures to the total outlay. Then the cost of dispatching and roundhouse labor is not dependent upon the length of the run the locomotive has made, but is as great for a trip of 100 miles as it is for 200 miles. Consequently where division terminals can be so changed as to make the locomotive runs longer, roundhouses can be closed, resulting in a considerable reduction in the amount of labor required to handle locomotives at terminals, as well as a material reduction in the cost of the labor remaining to be done in the houses retained. Another advantage gained is the greater mileage that can be obtained from locomotives when the runs are lengthened.

Most roads find themselves possessed of engines of moderate size, provided with boilers much too small for the cylinders and carrying a low steam pressure. If these engines were rebuilt and given new boilers the tractive weight and power would be largely increased by the larger boiler and higher steam pressure. Whether it is advisable to do this depends upon the service the rebuilt engines are intended for. Perhaps, I can best illustrate the man-



ner in which this matter should be viewed by taking actual cases. A road needs for its passenger service an engine, the equivalent in power of a 17-in. engine carrying 180 lbs. of steam. Its modern power is all large and the 17-in. and 18-in. engines owned by it will not do the work because the boilers are too small and they only carry 140 to 150 lbs. steam pressure. To rebuild one of these 17-in. engines, giving it a new boiler, will cost, approximately, \$4,500. It will pay to do it, if the machinery is heavy enough for the higher pressure, as a new engine for the service required will cost about \$8,000. We save not only the difference in the cost, but we have one less small engine on our hands. But suppose we expect to use these rebuilt engines in freight service and have no particular place for them, but only contemplate increasing their capacity by the rebuilding; we would gain about 20 per cent. in power by the change. If the tractive power of the old engine be expressed by the number 100, then three engines re-

ing, other things being equal. On the ton-mile basis the man who hauls the heaviest train may expect to have the best record. Thus we furnish an incentive to actual economy of operation, instead of putting a premium on extravagance. Furthermore, if we had not considered the ton-miles we should not have seen any economy in fuel in our 750-ton train as compared with a 600-ton train, in our example of engine rating. The value of the ton-mile statistics is also illustrated by the records heavy modern engines are making on many roads. When these engines are first put in service the men find they burn a large amount of coal per mile run, and use more oil than the smaller engines. Computing their fuel, supplies and repairs on the ton-mile basis, however, the performance is seen to be a wonderful improvement over the smaller engines, and fully justifies their use on divisions whose business is heavy enough to properly utilize them.

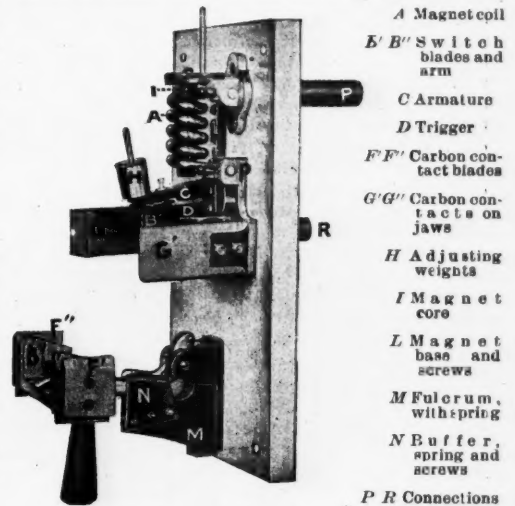
#### A Small Direct Current Motor.

The General Electric Company announces a new line of direct current motors of small capacity adapted to use on small machines. They have the designation of "Type C. A.," and in their design the production of an efficient motor, sufficiently light and compact for installation where space is limited and rigid support unobtainable, has been kept in view. A magnetic circuit, entirely of laminated iron has been adopted, and greater lightness and compactness thus secured than would have been possible with cast iron. Furthermore, by the use of laminated iron a uniform magnetic circuit is insured.

The construction of the armature, commutator and field coils follows closely that in the standard General Electric railroad motors. The laminated armature core is toothed and wound with the Eickemeyer type of coil. The leads from the armature are soldered directly into slots in the segments and the field coils are thoroughly taped and mounted on laminated pole pieces. The armature can be withdrawn after taking off the pulley and bearing, and the field coils removed through an opening in the frame. In the larger machines the shaft is mounted on two similar swivel bearings each self-oiling. The brush holders are adjustable radially, and may be revolved around the commutator if required.

The speeds are lower than usual with motors of small capacity; better provision for overload is thus given. The regulation, efficiency and disposition of

type of automatic circuit breakers for direct current circuits, and the other of the switches for alternating and direct current circuits for potentials not exceeding 600 volts. This new apparatus is of somewhat novel construction, deserving a brief description. In the circuit breaker herewith illustrated the trigger holds the switch closed and a pair of carbon contacts are so arranged that they will continue connection with the carbon plates for a short time after the metal jaws of the large double break switch have broken their con-



The Westinghouse Automatic Circuit Breaker.

tacts. These instruments are made for a potential not exceeding 750 volts.

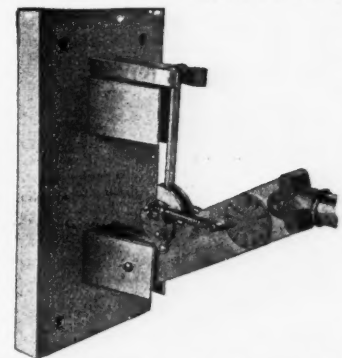
The new type of high potential switches here illustrated, with the handle removed are made to withstand very heavy usage. The jaw is a solid block of pure copper with heavy copper rosettes slightly cupped riveted to the blade. The points to which particular attention has been called in these are, first, the arc is not broken on the current carrying contact; second, the arcing contact on the jaws and blades are easily renewed, and third, the design of the switch is such that the hand is safely removed from the arcing contact before the auxiliary blade opens the circuit, as shown in the engraving.

#### Report of Massachusetts Special Commission on Street Railroads.

The special committee appointed last year to report to the Legislature of Massachusetts on the relations between cities and towns and street railway companies sent its report to the Legislature on February 2. The members of the commission were Charles Francis Adams, William W. Crapo and Elihu B. Hayes. The Commission held numerous hearings in Boston, and the members visited numerous other cities, States and countries to gather information, Chairman Adams going to England and the Continent of Europe.

The report begins with the statement that, although a great amount of experience has been accumulated, bearing on the street railroad problem, during the last 25 years, in all parts of the civilized world, no comprehensive study of the subject has been made. There are innumerable short treatises, largely unreliable, but no sufficient body of reliable data can be found, either in official documents or elsewhere. There is much popular misinformation, especially concerning the alleged highly satisfactory working of municipal schemes in Toronto, Birmingham, Glasgow and Berlin. The committee have been unable to find the street railway Utopia which had been reported to exist in these cities. The dearth of information was as pronounced in Europe as here, the statistics being even less perfect.

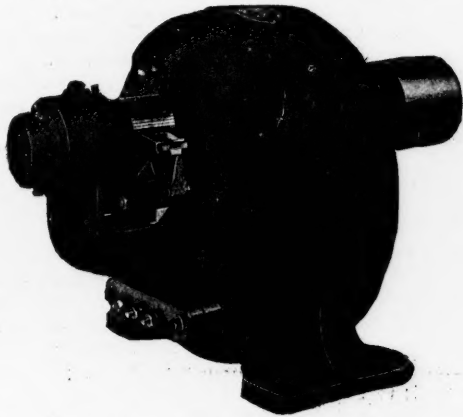
"The committee has no disposition to appear to



Westinghouse, Single-Pole, Quick-Break Switch

exaggerate the importance of street railway developments, and the interest felt in them; but as the investigation proceeded it became apparent that not only was the whole civilized world at work on improved municipal transportation, but every considerable town in both hemispheres is acquiring experience of more or less general value in regard to it, while at the same time seeking to learn the results of experience elsewhere. This is more obviously true of material and scientific appliances—cars, motors, inductors and track laying; but in its other

(Continued on page 124.)



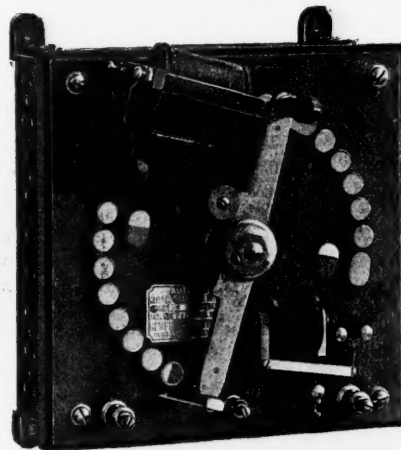
Direct Current Stationary Motor, Type "C A"—1 H. P.

built would have a total tractive power of 360. The cost of rebuilding the three engines would be \$13,500. Now, if we leave the old engines as they are and spend \$11,500 of this money in purchasing a heavy modern freight engine, we will be able to get one with a tractive power represented by 175; and we would then have four engines (three old and one new) with a combined tractive power represented by 475, or an average of 118.75 per engine. If we should scrap one of the 17-in. engines we would have three engines with a tractive power of 375 or an average of 125. Thus we find that for \$2,000 less money we can by purchasing new power and keeping all our power get almost exactly the same average tractive power as by rebuilding, and that if we would scrap one old engine for each new one purchased, the average tractive power of our engines would be considerably increased over what we could obtain by rebuilding. Evidently the figures are against rebuilding except where the rebuilt engines will fit into some particular place, generally in passenger service.

To successfully carry on a business as large as we have been considering, a complete and thorough organization is necessary. Improved methods or designs worked out at one point should become the practice at all others, if capable of more than a local application; in this manner only can advantage be taken of the ability and ingenuity of those in charge at each point. A successful organization must not only assign to each person in it certain responsibilities and duties, but it must be of such a character as to utilize the best work of each one. By giving to all as much of a voice in shaping the policies of the department as is consistent with the responsibility which must rest with the head of the department, the best results will be obtained. Co-operation, however, should not be confined to those in official positions. The further this spirit of co-operation can extend into the rank and file of the department the better it is for the company, its officers and the men themselves. There is a wonderful amount of loyalty on the part of the men towards a great railroad corporation that at all endeavors to treat them justly, and fortunate is the company that wins that loyalty. Its value cannot be computed. Many corporations and many officials possess it, and they have won it without yielding any of their own rights to the men, but simply by according them justice at all times.

Statistics properly kept are of great value. By their use the business of the department can be grasped in its entirety. But in order that they should not mislead, they must not only be accurate, but must be on the right basis. In the past nearly all of the statistical work of the department has been computed on the engine-mile basis. In many respects this is desirable as the engine-mile is far from being a constant unit. The ton-mile is a much better basis for much of our statistical work. Already we have placed all our coal records on this basis and it is probably only a question of time when repairs and supplies will be computed in like manner.

The importance of this matter is illustrated in our coal records. On the engine-mile basis the engineer who hauled the lightest train made the finest show-



Automatic Motor Starting Rheostat.

the material in the "C A" motors combine to give them a continued high economy. Heating tests show that they will run continuously, but with slight increase in temperature, and even with a momentary overload of 100 per cent. little or no sparking is noticeable.

No rails are necessary with this motor. The belt is tightened by moving the motor on the lag screws, which pass through elongated holes in the foot of the frame and hold the motor in place.

One advantage in this motor is the possibility of putting it in almost any position with no greater change than turning the bearings to suit the position. The "C A" motor may be installed on the floor or be suspended from the ceiling, be set on a shelf or attached to the wall. In every case the oil cellar is at the bottom of the bearing.

The 1 H. P. and ½ H. P. motors are designed for 115, 230 and 500 volt circuits; the ¼ H. P. for 115 volt circuits. The floor space for the first is 22½ in. by 16½ in., and for the ½ H. P. motor 18½ in. by 13 in.

For use with the two larger sizes a new type of rheostat has been developed. It is provided with an automatic switch which breaks the circuit in case of overload and effectually protects the motor armature. The smaller size are series wound and require no rheostat.

#### Westinghouse Circuit Breakers and Switches.

The Westinghouse Electric & Mfg. Co. recently issued two small catalogues, the one descriptive of the new





ESTABLISHED IN APRIL, 1866.  
Published Every Friday.  
At 32 Park Place, New York.

#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

The Illinois Steel Co., in its report for 1897, says that it paid in freight on its shipments during the year "between nine and ten million dollars, or about one-eighth of all the freights paid in the United States." That is certainly furnishing a great deal of work for the carriers, and as the company turned out only about 1,000,000 tons of finished product, its freight bills must have been a very large proportion of the total value. It is to be remembered that the company smelts the ore and makes the pig iron which it consumes, and that its works are far from the ore beds and the chief supplies of coke. In 1895, when its product was about one eighth less, it received 4,355,000 tons of raw materials (making 1,000,000 tons of pig and spiegel, and 876,000 tons of finished product). For last year the quantity is not given. Then the distribution of the product in some cases must have cost large sums; for the company shipped its goods not only to every state and territory in the Union, but "to Canada, Mexico, South America, Africa, all the principal cities in Europe, Siberia, Korea, Japan, China and Australia," and "it is almost a daily occurrence to bill goods to points from 5,000 to 15,000 miles distant." All of which is eloquent testimony to the progress made in cheapening transportation.

At the last meeting of the Master Car Builders' Association, a topical discussion was held as to the advisability of adopting standard coil springs for freight car trucks, and the subject was considered of sufficient importance to be referred to a committee, which will report at the next meeting. The principal points brought out in the discussion referred to were that round bar steel is more effective, cheaper and in every way preferable to any other shape of bar for coil springs and that the graduated spring is rapidly going out of use. It was suggested that the committee report on a standard coil spring and how the springs should be arranged in groups for diamond trucks, used with various capacity cars; also to recommend designs for standard coil springs to be used on the journal boxes of pedestal trucks. The Central Railway Club a short time ago appointed three of its members as a committee, who should investigate and report on the subject of coil springs for freight cars, and the committee's report will be found in full on another page of this issue, and it will be of material assistance to the similar M. C. B. Committee. After examining a large number of cars it was decided that the standard springs for diamond frame trucks should be made to fit a spring space 6 in. high for 40,000 to 50,000 lbs. capacity cars, 7 in. high for 60,000 lbs. capacity cars and 9 in. high for cars over 70,000 lbs.; the best width of the spring space for these cars was found to be 11 in. While the committee found a number of graduated springs, the single coil spring was found to be the type in general use. Single coil springs of the four-group type, of dimensions suit-

able to the spring spaces above given, are recommended for diamond trucks used with cars varying in capacity from 40,000 to 100,000 lbs. For pedestal trucks used with 60,000 lbs. cars the limit of the spring space was found to be practically 7 in. in height and 7 in. in width, while for the same type of trucks for 90,000 to 100,000 lbs. capacity cars, the present limit is 8 in. in height and 8 in. wide. For such cars double-coil springs adapted to the pedestal form of truck are recommended. It will be noted that much stress is laid on the character of the steel used for car springs, and that the specifications given are quite explicit in regard to the chemical composition, the chemical analysis of a steel being given which has been found to produce the best results in service.

In this issue will be found a continuation of the extracts taken from a recent work by Mr. von Borries on some features of locomotive design. The first of these articles was published in our issue of Jan. 14. The principal topics treated this week are the traction due to the weight on the locomotive driving wheels, the calculation of the principal dimensions and the water and coal consumption of locomotives. In view of the discussions which have arisen over the proportion of the weight on the driving wheels which is available for traction, it is interesting to note the ratios given by Mr. von Borries. It is stated that for freight locomotives running on tracks of moderate curvature, the friction of the drivers on the rails can be taken as 335 lbs. per ton of 2,000 lbs., while 300 lbs. per ton is given for freight engines on roads having sharp curves and for passenger locomotives under average conditions. This would mean that in German practice between 16 and 15 per cent. of the weight on the locomotive drivers is counted on for tractive purposes. A short time ago it was stated in an English technical paper that one-sixth, or between 16 and 17 per cent., was the proportion commonly assumed in English designs. Recent tests in both freight and passenger service in this country have shown the coefficient of friction between locomotive driving wheels and the rails to be about 25 per cent. under favorable conditions, and never less than 20 per cent. is used in calculations.

The formula presented by Mr. von Borries for calculating the diameters of locomotive driving wheels gives for locomotives running at an average speed of 20 miles an hour, 50-in. drivers; 60-in. drivers for engines whose average speed is 40 miles an hour, and 88 in. drivers for engines making an average speed of 60 miles an hour. It will be seen that this formula gives results not far from accepted American practice. Single expansion locomotives are recommended for pushers and switching engines and compound locomotives for regular passenger and freight service. The ratios of grate to heating surface given for extreme cases will be found to apply quite closely to American locomotives, while the formulae for the principal dimensions, with proper modifications, may be found useful in this country. The values given for the water and coal consumption of German locomotives are interesting, but the figures cannot be directly compared with similar data obtained from American engines on account of the different fuels used, and because of differences in the design and construction of the working parts.

Certain misleaders of labor are trying to get the cotton mill operatives of New England to go out on a general strike. The New Bedford operatives have so far been restrained by wiser counsels, and perhaps the strike will be averted. If we had not been familiar, through long experience, with the ignorance or recklessness or selfish unscrupulousness of the so-called leaders, we should be astonished at the proposition to involve New England in a general cotton strike. It would be hard to imagine a more hopeless and useless struggle. If the owners of the mills are able to keep the mills going in face of the Southern competition the operatives ought to be thankful and they ought to do all they can to postpone the day when the New England mills will have to be closed. The main reason for the reduction of wages in the New England cotton mills, against which the strike is proposed, is the competition of the Southern mills, and there are certain conditions acting there which neither the operatives nor the owners of the Northern mills can control. A workman can live cheaper in the South than in the North. Perhaps he does not live as well and is not accustomed to live as well there, but he can live cheaper. Consequently, he can work for less wages. Furthermore, the week in the Southern mills has more hours than in the Northern mills, and the Southern mills are not restricted as to the

employment of children as are the Northern mills. These two conditions may be changed eventually by the enactment of labor laws in the Southern states, but we should suppose that, considering the undeveloped state of this kind of industry in the South and the anxiety of the Southern people to bring in manufacturing, it will yet be a good while before the labor laws in the Southern states are brought into harmony with those of the Northern states. Still another condition working in favor of the Southern mills is the proximity of the cotton fields. Considerable cotton can be hauled to the mills on the farmers' wagons, and in any case the carriage by rail and water is much less than to the New England mills. Considering all these things it would seem as if a struggle against reduction of wages in the New England mills must be hopeless, and we should suppose that the operatives would take warning by the fate of the strike in the English engineering trades, which resulted so disastrously. After four months of strike the men surrendered with a loss in wages and in relief assessments estimated at about sixteen millions of dollars. The privation and suffering among their families cannot be estimated or expressed in any way.

#### The Massachusetts Street Railroad Report.

This report, the substance of which is given in this issue, is one of the most valuable documents, official or other, on a transportation subject, that has appeared for a long time; besides being a mass of facts, collected with intelligent care, with comments thereon by competent men, it is valuable because everybody has been waiting for just such a work to be done. The men who made this report are distinguished citizens, of high character, and the chairman, who may be called the father of the first important and efficient American state railroad commission, has been an expert on the relations of the public to transportation companies for thirty years or more. A careful and world-wide investigation of the financial relations between cities and street railroads would have been valuable at this time, by whomsoever made, for reasons which are stated in this report and which are well known; but the public is particularly fortunate in having it made in Massachusetts. That state not only supplies public-spirited men, but, in addition, already has laws for the regulation of corporations which are wiser than those of most states, and therefore the committee has, as it were, a good background for its work. Some states would be doing well if their relations with street railroads could be brought up to the point which Massachusetts has already attained.

The principal recommendations of the report are (1) that the corporation tax now collected by the state from street railroads and paid over to the towns where the stockholders reside, be henceforth paid, instead, to the towns containing the tracks; (2) that if dividends in excess of 8 per cent. are paid, a sum equal to the excess shall be paid to the state to be distributed to the towns with the other tax; (3) that there be a (new) tax on gross earnings payable to the towns, in lieu of payments for paving, clearing snow, etc.; and (4) that cities and towns may lay and own tracks, or take over those of existing companies, leasing rights to companies for periods of seven years.

The first recommendation is of interest chiefly in Massachusetts, relating, as it does, to a question of the division of the taxes between towns and the state. This is affected by the disposition made of other taxes and, therefore, may or may not be applicable in other states, according to the conditions in each. This proposed change will make a large difference in some towns. The Taunton Gazette shows, for instance, that Attleboro has few stockholders but considerable track; and, where it formerly received from the state \$17, will, if the new law is passed, receive (including the road tax) \$1,039. The inclusion of the road tax—a percentage on gross earnings—makes the comparison obscure, but it is clear that the differences are important. The town of Swansea, having as residents a number of stockholders but no street railroad, will lose the whole of the \$506 which it now receives from the state. Fall River's increase will be from \$587 to \$9,712; New Bedford's from \$5,287 to \$9,292. Both the first and the third recommendations are eminently sound. The first is in accordance with the principle held by the best known experts, that business should be taxed where it is done; and the third is justifiable by the simplification of dealing which can be effected by it. Whether the tax on earnings is or is not estimated by the committee at exactly



the right percentage to defray the cost of paving and clearing off snow, there can be little doubt that the towns and the companies will be able to so adjust their relations to one another as to avoid any serious injustice under this provision.

The second recommendation is on a point that must of necessity be compromised. Cities and towns would like to limit all dividends to six per cent.; investors would like to be free from any restriction whatever. But if we agree, as all enlightened citizens must agree, with the committee in its strong advocacy of local self-government in matters closely affecting streets, we must admit that some fixed stipulation concerning profits is a necessity of the situation. The absence of it is a constant temptation to hurtful agitation, and a company operating in ten towns is liable at any time to have ten different agitations to deal with. A compromise on a definite dividend tax being desirable, a figure recommended by such a conservative committee as this has everything to recommend it.

The fourth recommendation is the most radical of all, for it seems to lean toward full public ownership of street railroads, which would bring in all the evils of political control and instability of management, with deadening of enterprise, or, worse yet, enterprise in wrong directions. Yet this change is exceedingly simple; it is grounded in common sense and appeals powerfully to every one's reason; and the conservative committee recommends it unreservedly. Mr. Adams's comparison of the street car with the omnibus is unanswerable, and his extensive and careful inquiries in Europe seem to have developed nothing to weaken his opinion in favor of complete ownership by towns of every element of their permanent ways. This recommendation is in the same line as the third, but carried further. Where two companies run cars in the same street a single impartial ownership of the track seems to be demanded by simple business prudence, for the lessening of the friction between the different parties.

This report is as valuable for what it does not recommend as for what it does; and the committee's summary of the experience of the United States, Canada and Europe during the past ten years constitutes an important chapter of history. The appendix, when it appears, will amplify this feature and add much to its value. The salient points are that the fixed-term franchise is not, under present circumstances, a pressing need in Massachusetts; that English cities have suffered decidedly by putting too severe restrictions upon their street railroad companies; that Massachusetts towns do not need more or better laws to enable them to make better general bargains with street car companies, but more capable or alert public officers; and finally, that, therefore, ownership and operation of street railroads complete, by cities or towns, is decidedly unadvisable.

#### Northwestern Lumber Production.

The elaborate statistics of Northwestern lumber production published in the "Northwestern Lumberman" of Jan. 22 show, as was to be expected, a considerable increase in 1897 over 1896, but with the exception of 1896, the production last year was the smallest since 1881. The field covered by these statistics may be described briefly as the United States white pine territory in the vicinity of the Great Lakes, all comprised in the two peninsulas of Michigan, in Northern Wisconsin and in Eastern Minnesota. By far the larger part of the production is of white pine, but of late years considerable and increasing quantities of hemlock have come from the same mills and it has been included with the white pine. This year for the first time the quantity of hemlock has been reported separately, and is found to amount to about 7 per cent. of the total. Hardwood lumber, which is produced largely in Michigan and Wisconsin, but also outside of the white pine territory, is reported separately.

Lumber consumption is perhaps the best single indication of the prosperity of the vast agricultural territory west of the Great Lakes and Ohio. In hard times new building is reduced to what is indispensably necessary; when the people are prosperous, in town and country alike, building increases greatly.

There is, however, one fact which, taking a long series of years, affects lumber production more even than the varying degrees of prosperity, and that is the available stock of trees. The lumberman is reaping a harvest which takes a century to mature; and while for a long time he was able to meet every increase in demand by going further and further into the wilderness, that time in the white pine territory is now gone forever, and it is questionable if any de-

mand would make it possible to supply in a single year much more than the 8,854,000 000 ft. produced in 1888, and certainly such a demand could not long be supplied from this territory.

The lumber production increased rapidly after the war and reached 3,994 millions of feet in 1873; then in the hard times decreased to 3,609 millions in 1878, averaging 3,803 a year for these six years of great depression. The beginning of prosperity in 1879 was accompanied by an increase of one-third in the production, and by 1882 it had grown to 7,552 millions, or nearly twice the average of the six years from 1873 to 1878. This was not far from the average production until 1888, when it rose to 8,854 millions, which is the maximum in the history of the business. For the last eight years the production has been, in millions of square feet:

1897.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
8,598	7,881	8,594	7,326	8,822	7,051	5,726	6,213

The increase in production last year over 1896 does not adequately indicate the increase in consumption. A very large part of the production of any year remains at the mills at the close of the year. Green lumber is very heavy, and, moreover, not fit for use; by keeping it for some months a vast amount of freight is saved. In the year of greatest production the stock at the mills at the close of the year was nearly half of the year's production. When consumption begins to fall off it is likely to decrease more than the decrease in production. Thus, while the production of 1893 was 1,269 millions of feet less than in 1892, nevertheless the stock on hand at the mills was 419 millions greater at the end of 1893 than at its beginning. The mills marketed 1,809 millions, or 21 per cent. less in the latter year, though they produced only 15 per cent. less. And so, allowing for the increase or decrease of the stock at the mills, the quantity marketed (which must be much nearer than the production to the quantity consumed) has been, in millions of feet:

1892.	1893.	1894.	1895.	1896.	1897.
8,716	6,907	6,700	6,815	5,832	6,472

Thus the lumber marketed by the mills last year was 620 millions, or 10½ per cent. more than the year before. This increase, we are told, occurred chiefly or wholly in the last half of the year. It is certainly considerable and important, but it still leaves the consumption below that of any recent year except 1896. Those who are fond of comparing the present conditions with those of 1879 and 1880 may note that there was an increase of 33 per cent. in production from 1878 to 1879; against this increase in consumption of 10½ per cent. from 1896 to 1897.

One need not be very old to remember when substantially the whole of the immense quantity of lumber marketed through Chicago and Milwaukee was supplied by mills on Lake Michigan and Green Bay or tributaries thereof. This territory, called in the "Lumberman's" statistics the "Chicago district," as late as 1887 produced about 31 per cent. of the total. Its production has been declining every year since 1892, and last year was not 24 per cent. of the whole and was 36 per cent. less than 1891 or 1887. Muskegon, which at one time was the greatest producer, and in 1887 turned out 665 million feet, last year produced but 25 millions. All the mills on the east shore of Lake Michigan were credited with 1,233 millions in 1887, 815 millions in 1892 and 359 millions in 1897. The mills on railroads in the interior of the lower peninsula of Michigan sawed 733 millions in 1887 and 427 millions last year; the Saginaw district, 1,498 millions in 1888 and 481 last year.

The chief source of supply now is Northern Wisconsin (not including Green Bay and its tributaries) and Minnesota, which the "Lumberman" calls the "west of Chicago district," and which markets nearly all its product directly by rail, and not through Chicago. In 1887 this territory produced about 41 per cent. of the whole; last year 60½ per cent., and one-sixth more in quantity last year than in 1887, though not so much as in 1888, or in any of the six years from 1890 to 1895. In the sub-district described as "above Minneapolis," the production was six times as great in 1897 as in 1887, and larger than ever before, and the Duluth sub-district also had its largest production last year. These two sub-districts, together with Minneapolis itself, produced 1,232 millions last year, against 456 in 1887; and this 1,232 millions was more than one-fifth of the total white pine production.

All this shows that the lumbermen are getting most of their lumber in the districts latest invaded, and that the older ones are becoming or have become exhausted, which is of course inevitable in the nature of things.

The effects on carriers is important, as changes in the sources of supply frequently require change in the routes of transportation. The railroads

with lines in Northern Wisconsin and in the adjacent lumber districts of Minnesota now have a great advantage in supplying the territory west of the Mississippi, which not so long ago obtained most of its lumber from Chicago or from mills at the Mississippi River crossings, to which logs are floated from the Upper Mississippi. But this does not tell the whole story; as white pine has become scarcer, the consumption of hard pine from the South and of hard woods has become greater; and on some railroads these afford a very important traffic. For instance, the mills on the Wisconsin Central Railroad sawed 84 millions of hard wood lumber last year as well as 134 millions of pine, and the whole hard wood lumber production reported by the "Northwestern Lumberman" (almost exclusively in Michigan and Wisconsin) was 464 millions, which is 74 per cent. of the white pine production.

The Interstate Commerce Commission has decided the free storage case. The opinion is by Commissioner Yeomans. The case was brought by the American Warehouseman's Association against the Illinois Central and fifty-two other roads. The opinion says: "The function of the carrier is to receive, transport and deliver. As a rule, it can only be forced into the position of warehouseman through lack of diligence on the part of the consignee. A common carrier cannot assume to provide shippers with valuable warehouse facilities which are not essential to its business as a carrier, without furnishing them for all shippers at all times and upon the same terms, and notifying the public thereof in the manner provided by law. Distributing consignments in part lots to different subsequently designated persons, re-shipping upon shipper's order parts of consignments held in store, suspending collection of charges for use of cars beyond specified reasonable periods of time after such cars have been placed for loading or unloading by shippers or consignees, and all kindred concessions, come within the same requirements of impartiality and publication. The granting of these privileges is forced by the stress of competition between carriers. The decision holds that charges made by carriers for transportation and terminal services, and all rules and regulations which change or affect the aggregate compensation, must be shown upon their published rate schedules. A general order directed to all carriers is issued, ordering them to plainly indicate upon the published schedules what storage in stations, warehouses or cars will be permitted, stating the length of time, the character of the storage, the services rendered in connection therewith, and all the terms and conditions upon which the same will be granted. This order takes effect April 1, 1898.

Prof. Goss, at the last meeting of the Western Railway Club, outlined his ideas of what might be the value of a piece of experimental track for the use of engineering students who intend to enter the maintenance of way departments of railroads, and his remarks are given on another page of this issue. The establishment of such a track laboratory is really being considered by the authorities of Purdue University, and the scheme has some interesting features. In any such plan the value which experimental data have for the practicing engineer should not be lost sight of in the endeavor to instruct students, and it would seem that the ultimate success of such a venture would depend largely upon the support which was given such a movement by outside engineers. To get this support it would be necessary to investigate subjects in which railroads are directly interested and to obtain really useful results. Whether this can be done would depend much upon the director and the facilities at hand for carrying on the work; without proper direction, a track department would become merely an interesting exhibit. The success of the mechanical laboratories would make it appear that possibly a useful department might be created at technical schools, having for their object the scientific investigation of problems connected with the maintenance of way department and the testing of track materials, but very much that is to be learned about tracks can be learned only by long use under traffic. Track does not lend itself to laboratory work nearly as much as do engines.

A Washington dispatch says that the House Committee on Labor is going to report a bill to prohibit blacklisting by railroad companies, except of men "who have used violence toward the company's property." In view of the shadowy nature of the power possessed by Congress over the relations between a railroad company and a man who has left its employ, and of the entire absence of evidence that a railroad blacklist ever existed, at Chicago or anywhere else, this news dispatch, like previous ones on the same subject, becomes valuable chiefly as filling for the humorous column; and this use is made still more appropriate by the assertion in the last clause that "a recent decision of the United States Circuit Court in Chicago, that it is



entirely lawful for a railroad to blacklist a man, provided it makes no false statements about him, ends the last hope of some 250,000 men, who are endeavoring to obtain railway posts." We have no doubt that there are a quarter of a million men in the United States who would like to obtain "railway posts;" but if they have been living on such unsubstantial fodder as the hope that their chances would or could be improved by destroying all the blacklists in the country it is highly probable that they can live on air the rest of their lives; and the reporter's pathetic reflection is wasted.

We printed last week a communication with regard to the effect on the trees along the Boulevard (in New York) of the proposed railroad of the Rapid Transit Commissioners. On looking further into this matter we learn that the specifications call on the contractors to replace with new trees all trees killed during construction, the greater part of which would be destroyed. The average cover over the top of the tunnel would be enough to sustain trees, so that if the contractors should replace them they would grow and thrive for the greater part of the route; and of course it is quite practicable to transplant trees of considerable size, and the Boulevard need not be marred in that respect, except for a few years. Where the underground work would come too near the surface to permit earth enough to support trees, shrubs could be planted, and of course everywhere the grass plots could be maintained as now. It will be seen thus that in this respect the proposition is quite different from building an elevated railroad along the Boulevard.

#### TRADE CATALOGUES.

"Narrow Gauge Railroad Material."—Arthur Koppel, of 78 Broad street, New York City, sends us price list and catalogue No. 27, showing narrow gauge material for portable and permanent railroads. The catalogue is printed in English and Spanish, and names prices f. o. b. in various European ports. The material covers rails, steel ties, fastenings, joints, switches, portable and permanent turntables, and cars of various sorts, with their parts, including especially dump cars and plantation cars.

"Drop Forgings."—Messrs. J. H. Williams & Co. of Brooklyn, N. Y., send us an interesting pamphlet giving some account of the great variety of drop forgings made by that concern. They carry in stock a large number of different articles and make special drop forgings for pretty nearly everything, and will furnish estimates on receipt of model. They will also undertake to do annealing, tempering and case hardening to order. The pamphlet gives sizes and prices of the stock product.

Jacks.—A. O. Norton, 167 Oliver street, Boston, Mass., has just issued a new catalogue and price list. The pamphlet is fully illustrated with cuts of the Norton ball-bearing ratchet screw jacks, compound bridge jacks, traversing jacks, car jacks, street railroad jacks, car inspectors' or journal jacks, automatic lowering jack and Norton's sure-drop track jack.

#### Report of Massachusetts Special Commission on Street Railroads.

(Continued from page 121.)

and more abstruse aspects the problem is of the utmost hygienic and governmental importance. As a public agency the electric street railway is now fast revolutionizing the character of urban life, spreading it over a wider area and subjecting it to new influences; while entailing, in such items as paving, sewerage and police, a vastly increased municipal expense. Under these circumstances, while there is a widespread call for a comprehensive report on street railways, its preparation implies a very considerable command both of time and money, as well as of governmental machinery. To make such a report of general value, it would be necessary that the person preparing it should be not only in official communication with the whole consular department of the Government, but he would himself have to give from a year to eighteen months of time to local examinations, and the comparative verification of the statements which reached him. Neither the time nor the means at the disposal of the committee sufficed for work of this description.

The committee will try to have information gathered by the next National Census Bureau.

The scope of the committee's work was limited by the Legislature, and does not include mechanical or scientific apparatus, nor, except incidentally, financial questions of operation.

Though the street railway is in legislation as well as in the popular mind usually associated with the steam railroad, the two are, in law as well as in mechanics, quite distinct. Both are comparatively recent outgrowths of the tramway, which first came into use in the English mineral regions more than two centuries ago; but, while the railroad was a use of steam power in a new direction, and a pure consequence of the discovery of that power, the street railway was merely an obvious development of the old tram applied to the omnibus route. In its case the process of evolution was, therefore, in the earlier stages, quite simple. As the modern municipalities expanded, the demand for better facilities of urban, or, as it would be termed in Europe, intra-mural, transportation, made itself increasingly felt. Naturally the street car and the tramway at length suggested themselves as convenient agencies—the street car being nothing more nor less than an improved omnibus, and the tram-

way a special feature in the pavement of the public way; a feature adapted, it is true, to the car's special use, but not necessarily excluding from general use the portion of the street in which it is laid. This is all the street railway was fifty years ago, when first laid; it is all it is now—an improved line of omnibuses running over a special pavement. If this fact be firmly grasped and borne constantly in mind, the discussion, and the principles underlying it, are greatly simplified. The analogy throughout is with the omnibus line, and not with the railroad train; with the public thoroughfare, and not with the private right of way. Upon this distinction, indeed, all the questions now to be discussed, whether of taxation or of franchise privilege and obligation, will be found to turn.

Regulation by means of private ownership and competition has long been the prevalent theory, but this has had to be abandoned. The insufficiency of this theory, and the development of electric motors have brought forward new problems, and consolidation into single ownership is now a condition that must be dealt with. The experience of the last 40 years has developed three distinct lines of treatment of the relations between street railroads and municipalities. The first is the improved omnibus. "The company owning and operating the line is organized under a State charter, but holds its location in the streets under a municipal permit, usually granted for a fixed term of years, but in Massachusetts perpetual in theory, though in point of fact revocable at any time. This is complete private ownership, and it exists not only in America, but is almost equally well known and recognized in Europe. The second line of development is a recurrence to the original principles of ownership; the street and its pavements belong to the public, the vehicles that run upon the pavements to private parties, whether individuals or corporations. No distinction of ownership or control is under this system recognized between pavements, whether of wood, stone, concrete or iron, or a combination of two of those materials or of all; in any and every case the pavement is laid down and cared for by the municipality, which thus in no way surrenders or compromises its control of its own streets. Having laid, and owning, the pavement, it does, however, concede to a company, on such terms as may have been agreed upon, the exclusive right to run vehicles for a greater or less period of time on a specially prepared part of the pavement. In this case the vehicles and motive power only belong to the private company. The third line of development is in the direction of full public ownership—what is known as municipalization. The analogy of the public water and public gas service is here followed, and both private ownership and private management cease, the municipality running the omnibus as well as controlling the street and owning the pavement. In the course of its investigations the committee has enjoyed opportunities of studying each system in actual operation, and has heard the merits of each explained by managers and advocates."

Private ownership is most common in America. Municipal ownership of permanent way and private operation has been most developed in Germany, and municipalization is most seen in Great Britain. "In Europe, as in America, the use made of streets and thoroughfares, as well as their care, is essentially a municipal matter. The town or city, whether technically owning the public ways or not, is responsible for them, and, under certain broad general regulations, is free to control and regulate them in such way as it sees fit. The use of the highway for street railway purposes, in Europe, as in Massachusetts, was at first an innovation, and, as such, legal provision had to be made for it; but when that provision was made, either by general law or special enactment, it became largely an extension of municipal, and not of State, functions and control. The officers of the municipality were authorized to permit the occupation of streets for tram or railway purposes under provisions of law; but the control of the municipality over them was subjected to the least possible interference from without. In passing upon every question which may arise this principle of municipal street control also should be clearly kept in mind. That the street railway, like the thoroughfare it partially occupies, has in many instances outgrown municipal limits, and so become an instrument of inter-urban travel and communication, is apparent, and this fact also has to be recognized as introducing new elements into the problem; but the fundamental principle of local control is thereby no more destroyed in the case of the railway than in the case of the street itself."

In practical workings and results accomplished Massachusetts has fared as well as any State or country. "That the street railways of Massachusetts have, as a whole, cost much more than they could now be replaced for, is as indisputable as it has been unavoidable; that in some cases they have been over-capitalized, through questionable processes of financing, is more than probable; but these, after all, are to a greater or less extent incidents inseparable from an unusually rapid development along new lines and in untried fields. \* \* \* To institute a comparison between the street railway transportation of Boston as at present developed and that of Birmingham, of Glasgow or of Berlin, is so absurd as to suggest ignorance. The appliances in use in the European cities named may, and probably do, answer the demands there made upon them; but they pertain to conditions of urban life and of urban movement wholly different from those which now prevail in Massachusetts. Glasgow has a population of some 800,000, served by 73 miles of tramway, measured as single track; Leeds has some 400,000, served by 27 miles; Boston has nearly 500,000, served by 220 miles. In the neighborhood of 400,000 passengers are each day carried on the Boston street railways, while the combined railways of Glasgow and Leeds, serving a population more than twice as large, carry but 300,000. In other words, with more than five times the population to each mile of street railway track, the number of passengers daily carried in the two cities of Great Britain is only three-fourths of those carried in Boston."

In distributing urban population over a wider area Massachusetts is far in advance of any portion of Europe, and this improvement has been made in a very short time. Costly experiments have had to be paid for; but it remains to be proved that the work, though done through private corporations, either cost them, or through them cost the community, more than from a public point of view it was worth.

In Massachusetts the franchises are in terms perpetual, while in reality revocable at the discretion of local boards. In other States and in Europe concessions are generally for fixed periods of time, during which they are binding contracts. These contracts run from 14 to 100 years and have many conditions and restrictions, while Massachusetts grants have been devoid of technicalities and reservations. These Massachusetts grants, appearing to be perpetual, yet always liable to revocation, are highly illogical, yet it cannot be said that they have not on the whole worked well.

One of the main objects in appointing this committee was to see if a more fixed tenure of franchises should not be provided for by law, but no such change was advocated before the committee, either by the companies or by the cities. City officers desire to retain the right of revocation as a sort of "discussion budgeon," while the companies seem to prefer to put up with the liability of revocation rather than accept a tenure for a shorter term.

"It is a generally conceded principle, that in dealing with matters of public policy it is not wise to disturb existing methods, no matter how illogical or inconsistent with theory they seem, provided they work reasonably well in practice. The community is accustomed to certain ways of doing business and reaching results; and if the results, looked at as a whole and through a sufficient period of time, are satisfactory, it is questionable wisdom to scrutinize too closely either the logic or the symmetry of the ways in which those results are reached."

"The term-franchise, or concession for a fixed contract period, is, moreover, open to serious objections. As the members of the committee found wherever they studied it in operation, in this country or in Europe, it is apt to operate practically as a check on enterprise, and a bar in the way of any development involving the investment of fresh capital or of earnings which might be divided. The inducement is strong to get the largest profit possible out of the time conceded without increasing the value of a system a renewed lease of which will at some specified time be under negotiation. This has been markedly the case in Great Britain. The term-franchise has there been universal since 1870, and the rights of the municipalities are so very carefully protected that their best interests have been systematically sacrificed. The municipalities have, in fact, been so afraid they would in some way be out-bargained that they have as a rule fairly over-reached themselves; and now, after the lapse of twenty years, they are naturally served by undeveloped lines, with antiquated appliances, simply because they made it the distinct interest of the companies operating those lines to provide nothing better. The Massachusetts franchise, with its terminable-perpetuity feature, may be illogical—it seems, in fact, a contradiction in terms—but it recognizes an ownership under limitations, and the holder of the franchise works with the incentive of gain. In Europe the companies are all in the nature of tenants, or lease holders, trying to get everything they can out of their concessions during the term for which they are not likely to enjoy the results. In the end, therefore, the community suffers; and it is this sense of loss, and consequent discontent with the situation, which is the chief inducement held out for the experiment of municipalization; although, on the other hand, it is recognized that municipalization may involve an attempt at development on political rather than on business principles. The same thing was noticeable in the American cities visited by the committee. The term-franchise here, too, has been productive of dissension, poor service, scandals and unhealthy political action. There is probably no possible system productive of only good results and in no respect open to criticism; but, in fairness, the committee found itself forced to conclude that the Massachusetts franchise, which might perhaps not improperly be termed a tenure during good behavior, would in its practical results compare favorably with any. Certainly those results are as immeasurably as they are undeniably better than the results as yet produced in Great Britain."

"While, therefore, the tenure by which the Massachusetts street railways now hold their locations is calculated to excite uneasiness in the minds of security holders, yet that uneasiness is, so far as the public is concerned, not without its compensating advantages in management. Questions involving hardship and litigation may at any time present themselves, and this possibility, there can be no doubt, does stand in the way of the sale of street railway company securities at a price they would otherwise command. The investigations of the committee have not, however, led its members to believe that the public would derive benefit from the substitution of any form of term-franchise now in use in place of the prescriptive Massachusetts tenure."

In any event there is no present demand for such a radical change, and therefore the committee cannot recommend it.

It is claimed that city officers have granted concessions too freely, setting no limit on profits or rates of fare; and, on the other hand, companies claim that they are not sufficiently protected against arbitrary revocation of locations, and aver that, in view of the constant necessity of new apparatus their profits are not too large. But the committee does not find that on these points the law needs to be changed.

On the whole, the Massachusetts law rightly treats the whole matter of street railways as one of local concern. "The municipalities are held to be the best, and, indeed, within broad limits, the only judges of the use that shall be made of their streets. It certainly is not the part of the Commonwealth either to prescribe the terms of grants, or, after they are made, to examine those terms with a view to seeing that they contain nothing of which the parties to them may thereafter repent. It is the duty of those representing both municipalities and companies to insist on more specific and better considered grants, covering, if thought best, a given term of years, and binding in law during that term."

"Taking this view of the principles of polity and the public and corporate interests involved, the committee recommends certain changes in the present law, intended to make that law conform more closely to established practice and existing conditions. On the one hand, it would grant the local authorities explicit power hereafter to impose such terms and conditions as they deem the public interests demand, on original grants and locations in the localities over which they have jurisdiction; while, on the other



hand, it would protect companies whose tracks have been already located from new and perhaps unreasonable conditions sought to be imposed in grants of alterations and extensions, which may be called for not less for public convenience than by corporate interests. These suggestions are incorporated in the draft of the act herewith submitted.

"With the above exceptions, the Committee has seen nothing which would lead it to suppose that any detriment, so far as the public is concerned, has been or is likely to be sustained under the present system, except in one possible contingency. The representatives of the corporations asked that, throughout the Commonwealth, appeal should be allowed from municipal authorities ordering the revocation of a street railway location, to the Board of Railroad Commissioners, as is already the rule within the territory served by the West End Street Railway system. (Acts 1887, chapter 413, section 8.) While it is true the revocation of a location may be arbitrarily ordered, not only at a possible serious loss to a railway company, but at no inconsiderable inconvenience to a local public, the local public can generally be trusted in such cases to make its influence felt on its representatives for its own protection. So far as the corporation is concerned, the concessions made to it are general, valuable and unlimited. The corporation might perfectly well have declined to accept the concessions coupled with the power of revocation, and refused to lay its track. With a full knowledge of what it was doing, it accepted the location, coupled with the right of revocation; and it is not easy to see on what ground, still holding the location, it can now ask to have the counterbalancing burden of revocation limited, as being liable to abuse, but without being able to instance numerous cases of such abuse, or, indeed, to show that the relations between the municipalities and the street railway companies had, on the whole, or, indeed, in any respect, been less friendly or productive of fewer good results in Massachusetts than elsewhere."

In Massachusetts most street railroad companies have lines in two or more towns, and the committee recommends that the State Railroad Commissioners have power to revise the findings of local boards in certain contingencies, where one town suffers by some disagreement or disturbance in another town. To provide against possible disregard of the wishes of abutting property owners the committee recommends a law giving the power of protest to a majority of the abutters (counting by the value of the property), and to certain minorities (ten on a street). Where such a protest is made the location is to be valid only when approved by the State Railroad Commissioners.

The cost of widening streets to allow their use by cars is an important matter. Companies have heretofore contributed to such expenses, but possibly this was not a lawful use of their funds. Under the present law such expenditures cannot be capitalized. The committee recommends a law to cure this defect, permitting the assessment of a portion of the cost of widening, etc., on the street railroad company.

The Committee in considering the three lines of ultimate development (1) regulated private ownership, (2) municipal ownership of permanent way, with operation by private company, and (3) municipalization, says: The first method has the obvious objection that it involves divided control of the streets, resulting in continual jealousies and disputes; certainly not a scientific or satisfactory arrangement. It is clear, at all events, that the city or town should assume full control of its streets, the operating company paying a pavement and cleaning tax. It is difficult to fix a basis for such tax, owing to the great differences between city streets and country roads and to the irregular nature of the financial burden for removing snow and ice. This last feature has been a fruitful source of misunderstanding in Massachusetts, the city sometimes throwing snow back on the track as fast as the railroad threw it off. The Committee made such study as it could and drafted a law providing for fixed money payments by companies to cities in the nature of a road tax. The rates proposed are, on companies having gross yearly receipts of \$7,000 per mile of track, two per cent on such gross receipts; on those earning more than \$7,000 and less than \$14,000, two and one-quarter per cent; more than \$14,000 and less than \$21,000, two and one-half per cent; \$21,000 to \$28,000, two and three-fourths per cent; over \$28,000, three per cent. It is believed that this tax will be a fair equivalent of the burdens now borne by the companies for street repairs, etc. Though the basis of this law may not be exactly correct it is believed to be much better than the present condition of things.

The Committee favors the second method. This has been tried in Germany more thoroughly than elsewhere. European street railroad franchises are never perpetual, but are for fixed terms, averaging twenty years, the agreement being a binding contract. The conditions of these contracts were found to be uniform, but there is a tendency towards agreement upon a standard. The municipal contracts recently entered into by Berlin and Frankfurt, and that are now under consideration in Hamburg, are in Germany regarded as models, and consequently are in the main adopted in other German municipalities. These contracts, as showing the extreme caution practiced in foreign countries in dealings between street railway companies and municipalities, are printed in the appendix.

These contracts are in curious contrast to similar agreements in this country. They generally contemplate ultimate ownership of the permanent way by the city, and this is, indeed, now an accepted principle in Europe.

This principle should be followed in Massachusetts, even if franchises are not made for a specific term of years. In every franchise there should be a clear provision under which the permanent way may be taken over by the city. As to street railroads already existing, with indefinite franchises, the Committee recommends that in case a city or town desires to assume ownership it secure a special act of the Legislature, the same as though it were to take over a water or gas light company. The Committee presents a draft of a law allowing cities to take over a part or the whole of the tracks lying in the streets. This does not disturb the present law permitting cities and towns to revoke a location; it is perfectly practicable to change ownership and permanent way while not disturbing the franchise or right to run vehicles.

The third plan, municipalization, is yet in the ex-

perimental stage. It can be studied in its tentative stage in Glasgow, Leeds and other English cities, but these cities are so far behind America in street railroad development that no comparison is possible. In permanent way they are in advance of ordinary American practice, but in cars, machinery, etc., and in all other respects everything is either antiquated and positively bad, or else it has just been taken from America and installed by American companies. "In other words, in the field of scientific apparatus and mechanical development, America has experimented at immense cost, as our street railway capitalization shows, while Europe has patiently waited, and is to-day rapidly and quietly appropriating the results for which we have paid. As respects municipalization, the conditions are likely to be reversed. Foreign countries, and more especially Great Britain, seem disposed to experiment, and experiment on a very considerable scale; and perhaps it would be wise for America to allow these countries in this matter to bear the cost of so doing, sure of our ability at any time to appropriate all the useful results of foreign experience."

These English experiments have not been carried on long enough to be of real significance. The oft repeated assertions that indisputable success has already been achieved are wholly unfounded. No results worth studying can be expected for twenty years to come, and even then "political habits, social traditions, and material and economical conditions vary so greatly and enter to so large an extent into the problem that it will not be safe to infer that what may have proved safe and practicable in one community is either practicable or safe in another. At the present time, the municipalization of the street railways is not accepted as by means indisputably desirable in Great Britain, while in Germany it is regarded unfavorably. This last fact is the more noteworthy, as Germany has been the field in which State ownership and management of steam railroads has been developed to the fullest extent, and with results pronounced to be unquestionable, as well as most satisfactory. The grounds for this apparently illogical action and contradictory policy were, during the last summer, briefly set forth to a member of the committee by the highest German authority. They were purely practical. The State official referred to simply said that Germany had carried officialism as far as, in his judgment, it was prudent to go. The Government employees tended always to increase; and there, as here, it was found that employment by the Government signified much which did not at once appear. The line had to be drawn somewhere; and it was not considered expedient to add to the number already existing the numerous officials and employees of all the street railway systems in the Empire.

This subject is more fully treated in the appendix (yet to be printed) in the shape of a paper by Mr. Robert P. Porter. In Massachusetts municipalization would present grave difficulties. Ownership of tracks is a simple matter, but operation would be complicated. The West End Company, of Boston, for instance, runs cars in eleven different towns and cities, the Lynn & Boston Company in 19. Suppose, for instance, that the city of Somerville should decide to buy and run its street railroads. The neighboring towns would certainly introduce complications and Somerville would hardly care to do business in all the adjacent cities and towns. It is true that the scheme would not be impossible, and a law to permit joint ownership was introduced into the Legislature a year ago, but the committee has not felt called upon to tackle the problem.

On the subject of taxation the present Committee bases its conclusions largely on the work done by the Boston Rapid Transit Commission of 1891 and the joint special tax committee of 1892. These bodies recommended an exception to the general rule in the case of street railways, and the payment of the corporation tax levied upon them to the towns in which the companies operated lines, instead of to the towns in which the holders of the stock resided. A bill to this effect was introduced in the Legislature of 1893, passing the House of Representatives by a large majority, but failing in the Senate by a single vote. The Committee agrees with this view and recommends the passage of a law to put it in effect.

As to a further special street railroad franchise tax, grave popular misapprehension seems to exist as to the burdens in the way of taxation to which street railway companies are already subject,—a misapprehension due in no inconsiderable degree to the indirect and anomalous character of those burdens. It seems to be generally assumed that the street railway companies received, and are now receiving, public franchises of unusual value, for which they pay no money consideration and render very inadequate public service; that their profits consequently are inordinately large is also assumed, and that those profits are in some way concealed through a system of vicious financing and deceptive book-keeping.

"The facts, however, do not seem to be as assumed in this presentation of the case. A more careful investigation fails to disclose those Massachusetts franchises of great value given away without consideration, or unduly large profits on the part of the companies as a whole, or more than exceptional cases of vicious financing, or a deceptive general system of book-keeping. There are in all 77 street railway companies in operation in the Commonwealth. Of these, one, the Boston Elevated, or West End Street Railway, may be left out of consideration, its case being exceptional to such a degree as to make it necessary to put it in a separate class, as has in fact been done through recent legislation (Acts 1897, chapter 500). Of the 76 remaining active companies, 34 paid no dividends in 1897, while 42 paid dividends of from 1.25 to 10.5 per cent., averaging 4.29 per cent., a return certainly not excessive. Upon this point the inquiries of the Committee tend to confirm the conclusions of the Board of Railroad Commissioners in their report for 1896. While in the business of operating street railways, as in every other business, there are—as within reasonable limits there should be—exceptional cases of large profit offsetting cases of failure to earn reasonable profits, yet the idea sometimes entertained that the electric railway is likely to prove a source of extraordinary or abnormal profit must apparently be abandoned. It is a close business, yielding with skillful and prudent management only a fair average return, quite within the limit allowed by statute and conservative opinion as adequate and proper for investments of this character."

"Again, it is often alleged that the capitalization of the companies is excessive and fictitious, and that, if measured by actual cost, the percentage paid in dividends is deceptive. This is a difficult question to decide; but the laws of Massachusetts as to capitalization have been strictly drawn and rigidly administered, nor has any evidence been adduced showing that they have been peculiarly ineffective. On the contrary, using round numbers only, the capitalization per mile in stock and bonds (\$46,600) is less in Massachusetts than the average (\$49,500) in the New England States, not a third of what it is in New York (\$177,800) or half what it is in Pennsylvania (\$128,200), less than half what it is (\$94,100) in the United States as a whole; and it is less than that in Great Britain (\$47,000), where both construction and appliances are far less costly and elaborate, and over-capitalization has been guarded against with the utmost care. The truth of this allegation in the case of the Massachusetts street railway companies remains, therefore, to be demonstrated, the weight of attainable evidence being distinctly the other way." The Committee, therefore recommends no addition to the present corporation tax, except the percentage on gross earnings in commutation of the estimated present expenditures for street repairs, etc., before mentioned, and a tax on dividends above 8 per cent. Concerning this excess tax the report says:

"It is a well-recognized principle in the treatment of street railway and other public service corporations in Europe, as well as elsewhere, to provide that, after the owners and organizers have received a reasonable return upon their enterprise and investment, any excess of profits over and above a fixed amount should in part be paid to the government in the nature of a franchise tax. This principle commends itself to the Committee. It is not subject to the criticism, which appears to be sound, that a limitation of dividends hampers enterprise and improvement. Where a corporation is not limited in the amount of dividend it may earn, but is simply required to pay over a sum equal to the excess of dividends actually paid over a fixed and reasonable percentage on its capital stock, it will be constantly spurred to render such service that its profits will increase. Being a public service corporation, owned and operated for private profit, it seems just and in accordance with sound principles that, when the private ownership has received a reasonable return upon its investment, the public should share, through a form of special taxation, in the increment of profit, provided it can do so without the danger of offering an inducement to those in control of the property to stint or conceal their profits. A provision to this effect is incorporated in the draft of the act herewith submitted, similar in its general character to that recommended by the Rapid Transit Commission of 1892." It is recommended that this tax on dividends apply only to companies which have averaged at least six per cent. yearly in dividends since their organization.

#### The Drainage of the Valley of Mexico.

The canal to drain the Valley of Mexico and prevent the inundation of the city by the overflow of water from the surrounding lakes during the rainy season and also to carry off the sewage of the city, consists of an open cut from near the city gate at San Lazaro to Zumpango, a distance of 47.75 kilometers, and then a tunnel 10.10 kilometers long to Jejuquiac, through which the water is delivered outside the valley, it eventually reaching the Panuco River. The history of the efforts to drain the valley is so well known that it will not be repeated here.

Messrs. Pearson & Son, English contractors, took the contract for the completion of the open cut from kilometer 0 to the mouth of the tunnel at kilometer 47.75. The work up to kilometer 20.00 was then partially completed and in the hands of the Government engineers.

From kilometer 0 to kilometer 20 it has been delivered in different sections to the Government at various times, but is still incomplete. The ground through which it is cut is very treacherous, the banks having caved in, when the water was let out, and its completion is still a matter of some conjecture. The work is now going on under the supervision of the Government engineers, the peons carrying the mud and dirt out in baskets.

On December 25, 1897, the completed cut from kilometer 20 to kilometer 47.75 was turned over to the Government, who accepted it as satisfactory. All of the men employed by Pearson & Son have now been discharged with the exception of a few who are engaged in preparing for shipment such of the machinery as has not already been disposed of. The work on this section was completed and accepted by the Government in exactly eight years from the time the contract was signed. Although the greater part of the work was done in a much shorter period, yet the completion was delayed by unforeseen circumstances. The canal was cut by enormous dredges—the route lying through the lakes of San Cristobel, Xaltocan and Zumpango, which have now almost entirely emptied. After the water had been drained out of these lakes it was found that the canal was badly choked up with silt and mud that had washed in during the outflow of the water, and by slides of the banks, which were naturally in a very soft condition. This was moved by hand, the native peons carrying it out in wooden boxes. To prevent a recurrence of this, the slides of the canal have been covered with sod in places where it was deemed necessary and the bottom lined with stone.

The work in the tunnel was begun by the Government engineers in 1878, but progressed very slowly till in 1888 the contract for the completion was taken by Messrs. Read & Campbell, English contractors. It was accepted by the Government in December,



1894. As before stated it is 10.10 kilometers long. The cross-section is oval, lined with stone and concrete up as far as the water mark and above that arched with brick. The amount of flow of the water will be regulated by huge gates near the mouth at Zumpango. The ground through which it was cut was soft, decomposed rock removable with pick and shovel and 24 shafts were sunk along the route to facilitate the work. These have been now covered with removable gratings.

As it now stands, the canal has drained off a vast amount of the water in the valley, the lakes of Zumpango, Xaltocan and San Cristobal being practically dry and the level of lake Texcoco lowered several feet. This latter lake was not intended to be entirely drained, as such a proceeding was considered prejudicial to the sanitary condition of the city. There is a cut into the canal from Lake Texcoco at kilometer 20, and also the San Lazaro Canal forms a connection at kilometer 0. There will be gates at each of these two places and the water can be turned in at either place as desired. The sewage of the city, as heretofore, will have to be removed by the San Lazaro pumps until a different system within the city is built, and then it can be drained directly into the canal, which is low enough to carry it off.

Mexico, February 7.

#### A Discussion on Rails.

In the January proceedings of the Western Railway Club is published a discussion on Rails, written by Mr. P. H. Dudley, which in view of the knowledge of the author is given at considerable length:

The first question: "What is the Most Economical Rail for Railroads With Heavy Traffic?" The best contribution I can make to the discussion of this question will be to relate the improvements in the tracks which have taken place in the past fifteen years as shown by my track inspection which now cover a period of twenty years. The mechanism for summing up all the undulations in the track was completed for the annual inspection of 1881, and since then we have the annual condensed diagrams to date of the same roads, which show the improvements from year to year. Going over the same track for two or three years where great efforts had been made to improve them by labor, the results not being up to the expectations of railway officials, it was evident that the rails were not stiff enough for the constantly increasing traffic. The undulations per mile on the best track were over five feet per mile; while on the poorest the average was twelve feet per mile; the general average being about eight feet per mile.

It is now fifteen years since I designed the pioneer five-inch eighty-pound rail for the N. Y. C. & H. R. R. R. With 2.3 per cent. more metal the stiffness of the eighty-pound rail would be sixty-six per cent. more than the sixty-five-pound rail, which would be a very important factor in maintenance and the movement of the traffic. The pioneer eighty-pound rail on the New York Central, was replaced in 1892 by a six-inch 100-pound rail on the "Harlem Line." Three years ago a trial of the six-inch 100-pound rail was made for the interlocking switches in the Grand Central yard, which proved so satisfactory that since then all important points and connections have been laid with it. The switch points retain their position, do not become bent or sag, and work easier than the lighter points or rails.

The movements of locomotives and cars are so constant, the trackmen can do little to the track during week days. Surfacing a 100-pound rail once per year in the yard suffices to keep the track in good condition, while the eighty-pound rail required to be surfaced from four to five times per year. The undulations in the 100-pound rail reduce to one foot six inches to one foot nine inches per mile in the main line of the N. Y. C. & H. R. R. under my care, a joint rarely being indicated as the car passes over it.

The 100-pound six-inch rail provides for some increase in traffic and is without question the most economical rail for the heavy traffic of the Hudson division.

The Boston & Albany Railroad for the past twenty years has been raising its standard of track. Twenty years ago the entire line was laid with four-inch sixty-three-pound rail and supported joints. In 1880 it adopted a seventy-two-pound four and one-half-inch rail. On neither section was it able to maintain on the heavy gradients for any length of time a high standard of track. In 1890 it adopted a ninety-five-pound broad-headed rail 5 and one-thirty-second of an inch high, and laid 10,000 tons in 1891. It has laid several miles each succeeding season, completing the entire line this year. The inspection of the track last October, showed a uniform condition of track for the entire line, irrespective of the heavy gradients over the mountains. All the rails are low phosphorus and high carbon, and wear so smooth that the undulations in the rails laid in 1891 were less this year than in 1891. It takes about two seasons before these rails reach their highest standard of surface. I personally superintended the manufacture of all the rails, paid great attention to proper pooling on the hot beds, had all the anvils in the straightening presses lengthened, the blocks being not less than 40-inch centers, and 44 was used much of the time. This permitted the rails to be straightened without excessive gagging, the rails being well finished. The results of the decrease of cost of maintenance and operation leave no question as to the economy of using the 95-pound rail for this line. In 1883, after I had designed the pioneer 5-inch 80-pound rail, but before one had been laid in the track, I calculated the possible conditions of track for 5-inch smooth broad topped rails, as between the 14th and 16th line on my condensed diagrams; this meant rail not over two years' service. This year the average per mile for the Boston & Albany's entire line is 15.42, notwithstanding many rails have had 6, 5, 4, and 3 years' service. The results are as gratifying as they are astonishing.

Heavy rails should be finished smooth, far more attention being paid to that feature than is usually the case. The Boston & Albany Railroad has reduced its average undulations per mile from 8 feet in 1881 to 2 feet and 2 inches in 1897. The N. Y. C.

& H. R. R. R. pioneer 5-inch 80-pound rail was all straightened on presses with narrow supports and never reduced in the track to their proper value; 1 to 1½ feet or undulations per mile being due to the wavy surface from the gagging. The dynamic effects of every wheel load passing over the rails is thereby increased. All the rails it uses from my series of sections are straightened on proper supports and reduced to their minimum values in the track.

For heavy track on nearly level lines and mostly tangent, a stiff 80-pound rail is about the minimum weight for economy, while with lines for heavy gradients a heavier and stiffer section will be more economical.

"Does the Quality of the Rail Improve as the Weight Increases?" As the weight increases the reduction from the ingot decreases; more heat units are to be dissipated and for the same grade of metal the heavier section will be of lower quality. As the weight of the section increases, a corresponding increase in the grade of the metal must be made in the ingot under the present rapid method of manufacture.

"What is the Safe Maximum Rolling Load for Rail of Different Weights?" A load of which the static and dynamic effects does not stress the metal over one-half of its elastic limits. While this is high, the duration of the intensity of the stress under a wheel load is very short, something under .02 of a second in 5-inch 80-pound rails for a speed of 40 miles per hour, the track being in good condition. Higher stresses than those above stated do occur under a few trains a day, which in a few years leads to the checking of the rails and final fracture of some of the rails in cold weather; the rails being more or less under tension from the falling temperature. The actual fiber stresses in rails are higher than we generally suppose. Many years ago, before as high standards of tracks were maintained as now, the stresses often exceeded the elastic limits of the rails and permanent set took place.

The past season, I found, from determinations of the stresses by measuring the elongation and compression of the rails under moving trains, apparent stress of 45,000 to 50,000 pounds stress per square inch for the extreme fibers in the base of 4½-inch rails. The compression was over one-third of those amounts. On 5-inch 80-pound rails I found the apparent stresses 25,000 to 30,000 pounds under front driver, on rough rails and at speed of 35 to 40 miles per hour. The combined static and dynamic effects were double at 35 miles per hour on the rough rails over the static effects of drivers when standing still. This is much in excess of what it is on smooth rails. On the 100-pound 6-inch rails the stresses are much smaller. No formula has yet been proposed which gives anything like the actual stresses in rails under moving trains. There is the deflection of the rails, the compression of wood of the tie, the deflection of the tie, the compression of the ballast and that of the road, the smoothness of the rail and ties, and the speed. Then there is the wheel, and tie spacing. It is a very complicated question. I am attacking it by actual tests, but a great mass of data must be collected and analyzed before even general results can be stated.

#### TECHNICAL.

##### Manufacturing and Business.

The Boston Gas Light Company is building a new gas plant at Commercial Point with a building 52 feet wide and 185 feet long, having brick side walls and brick partition walls dividing the building into three distinct parts, a generator house, blower room, and condenser room. No wood is used in the building and it is fireproof. The floors are of steel throughout. The roof is slate on steel trusses and framing. The contract for furnishing and erecting the steel roof complete has been let to the Berlin Iron Bridge Company.

The Sargent Co., of Chicago, reports a large business in railroad supplies the past few weeks, and informs us that orders for the new Diamond "S" shoe are coming in rapidly. This shoe was fully described in our columns in a recent issue. Mr. W. D. Sargent, Vice-President and General Manager, has returned from England and the Continent, where he has been introducing the Diamond "S" brake shoe. Several of the railroads in England are already using it, and the prospect for a large extension of this business is flattering. The company has recently published the second volume in its series on the Diamond "S" shoe, giving results of the tests at Wilmerding, and they will furnish copies with results of service tests to railroad men on request.

The Standard Light & Power Company, of Dallas, Tex., has placed an order with the Walker Company for two alternators, one of 225 and the other of 325 K. W. capacity, to be directly connected to "Erie" engines, and designed to be run at 125 revolutions. The current will be 2-phase and 60 cycles. In addition to these the Walker Company will furnish two direct connected railroad generators of 225 of 325 K. W. capacity, respectively. Two alternating generators of 250 K. W. capacity each are being built for the North River Electric Light & Power Co. of New York City, of the belted type. Townsend, Reed & Co., of St. Louis, have bought for the St. Louis, Belleville & Suburban Electric Railway two 200 K. W. direct-connected generators, besides 8 double, 10 single railroad equipments with "S" controllers.

The Glasgow Municipal Tramway will place a number of Walker motors on its cars at an early date, while the electric railroad of Alexandria, Egypt, will increase its present Walker plant by the addition of one 150 K. W. belted generator with switchboard, and four double 3-N equipments.

The Fountain City Drill Company, Lacrosse, Wis., has been incorporated by B. E. Edwards, R. E. Osborne and J. E. Wheeler with a capital stock of \$100,000.

The American Brass Works, of Newburgh, N. Y., have been incorporated with a capital stock of \$30,000. The directors are: A. E. Anderson of Kingston, N. Y.; W. G. Ladd and C. B. Riker, of New York city.

The Foster Coupler Company has been incorporated at Muncie, Ind., with a capital stock of \$100,000. The Directors are: Charles Foster and Albert M. Fox, of Fostoria, O.; James Boyce, Carl A. Spilker, of Muncie, Ind., and C. E. Lambert of New York city.

J. S. Mundy, of Newark, N. J., has just built one engine to order for wrecking and dredging work for the Merritt & Chapman Derrick & Wrecking Co., with double cylinders, 10-inch drums, 13-inch stroke. It has a lifting capacity of 80,000 pounds. The engine is connected directly with the main hoist and boom drums, which are four in number and of large size and geared direct to the engine shaft. The engine is also provided with double cone trimming drums and so arranged as to be used for turning the boom of the main derricks and also for hoisting with the small derricks when required. It has a quadrant stand with all levers and brakes and throttle valve so that all can be handled by one attendant. Mr. Mundy is building a hoisting engine for the Hudson River Lighterage Co. with a lifting capacity of 125,000 pounds. It is a double cylinder engine, 11x16. There is also ready for shipment at the Mundy Works an engine for the New York Central & Hudson River Railroad Lighterage Co. It has double cylinders, 10x13-inch stroke and a lifting capacity of 80,000 pounds. It has four double tandem drums so arranged as to handle two derricks combined or separately, as desired. This engine will occupy a floor space of 14x19 feet.

The Harvey Steel Car Works, Harvey, Ill., were sold at judicial sale in Chicago, for \$150,000, Charles W. Allen, representing the first mortgage bondholders, being the purchaser.

The Buffalo Forge Company, Buffalo, N. Y., has received an order from the government for the blowers and engines required for revenue cutter No. 6, now being built.

C. M. Bean, for the past ten years sales agent and manager of the Franconia Iron & Steel Works, of Wareham, Mass., has opened an office at 8 Oliver street, Boston, Mass., under the firm name of C. M. Bean & Co., as sales agent in New England for Lindsay & McCutcheon, Allegheny, Pa.; Fitzsimons & Co., Cleveland, O., and Columbia Iron Company, Columbia, Pa.

The H. B. Smith Machine Company, Smithville, N. J., has increased its capital stock from \$100,000 to \$300,000.

The Maxwell Gas Engine Company has been organized in New Castle, Pa., with a capital stock of \$50,000, with the following officers: William Douthitt, president; S. E. Maxwell, vice-president; A. W. Gardner, secretary, and Paris Shoaf, treasurer. The company has bought the buildings of the Wampum Wire Nail Company, and will at once install the necessary equipment for the manufacture of gas engines of the Maxwell type.

W. H. Hooper has been appointed General Agent of the Safety Car Heating & Lighting Co. in Chicago, Ill., vice Geo. N. Terry resigned.

Standard platforms, made by the Standard Coupler Co., will be used on two new chair cars to be ordered by the Chicago Great Western and on twelve coaches for the same road, which are to be equipped with vestibules.

The Rome Planing Mill Co., Rome, N. Y., has been incorporated by H. Owens, Ed Evans, E. T. Williams and J. Evans, all of Rome, N. Y.

The Kellett-Chatham Machinery Co., Waco, Tex., has been incorporated with a capital stock of \$50,000 to manufacture, repair, buy and sell machinery. The incorporators are W. M. Kellett, E. Rotan, W. R. Clifton and others.

The Hancock Inspirator Co. reports an increasing business among the railroads. Hancock inspirators will be used on one side of each of sixteen engines recently ordered by the Northern Pacific; two engines for the Wisconsin Central and five for the "Soo Line," and on both sides of the four locomotives which will soon be ordered by the Southern Indiana.

C. A. Thompson, St. Louis, Mo., has been appointed Southwestern Agent for B. M. Jones & Co. of Boston. Mr. Thompson also represents the Pickering Spring Co., the Niles Tool Works Co., the Standard Steel Works and the Kalamazoo Railroad Velocipedes & Car Co.

The Robb Conduit & Underground Electric System Co. has been incorporated in the State of New York with a capital stock of \$25,000. The Directors are: F. D. Robb, G. E. Crittendon of Hot Springs, Ark.; Fritz Andraea and Gertrude Hanbury of New York City, and A. L. Wear of Cornwall, N. Y.



Press dispatches state that the New York Car & Supply Co. of Buffalo, N. Y., has secured an option on 50 acres of ground at New Castle, Pa., and will erect large works, employing 3,000 men. The capital stock of the company is \$2,000,000.

The date fixed by the National Association of Manufacturers for the opening of the sample warehouse which the association has established in the city of Caracas, Venezuela, is March 26. Some of the members of the association who have placed samples of their goods in the warehouse have signified their intention to join an excursion party, for which arrangements are now being made, to be present at the opening and to make a short trip through Venezuela, visiting the principal points of interest. The programme arranged for the tour provides for entertainment and opportunity to study the country.

At the annual meeting of the stockholders of the Steam Gage & Lantern Co., held in Syracuse, the following were elected Directors, the number being reduced from seven to three: Fred Dietz, President; William Henry White, Vice-President; P. L. Salmon, Secretary and Treasurer.

On Feb. 3 the Rhode Island Locomotive Works filed its petition in insolvency in the Appellate Court. The company was not at once adjudged insolvent, but on the petition of Geo. H. Wilson, the Treasurer, for the property, Mr. Wilson was appointed to take charge until the petition of insolvency has been adjudicated. The schedule of assets shows an estimated total value of \$518,376.57 and liabilities amounting to \$616,703.85.

The car works of the Merchants' Despatch Transportation Co. have been removed from East Rochester to Despatch, N. Y.

Newspapers state that an agreement has been entered into between the Builders' Iron Foundry and the Rice & Sargent Engine Co., and the Providence Steam Engine Co., all of Providence, R. I., by which the interests of the three companies are to be combined for the next five years, and that officers of the Builders' Iron Foundry have taken charge of the steam engine companies.

The New Jersey Car Spring & Rubber Co., Jersey City, N. J., capitalized at \$400,000, has been incorporated in Illinois with \$5,000.

The Washburn Coupler Co., Minneapolis, Minn., was incorporated Feb. 7 for \$100,000, by Wm. D. Washburn, Edwin C. Washburn and Caleb C. Crane of Minneapolis, who constitute the first Board of Directors.

The Maryland Car Co. of Chicago, Ill., has been incorporated in the State of Illinois with a capital stock of \$100,000 by Henry A. Gardner, Robert L. Dean and Frank E. Bradley.

We understand that the plant of the Pittsburg Car Wheel Co., Pittsburg, Pa., which has long been idle, is about to be put in operation and to be enlarged and improved.

The plant of the Chicago Portland Cement Co., at Hawthorne, near Chicago, was badly damaged by fire early on Sunday, Feb. 13. The loss is estimated at about \$100,000, most of which was from damage to machinery, some of which had just been installed. It is stated that the insurance is about \$50,000. It is not yet announced whether the company will rebuild. The plant was undergoing alteration and improvement, and employed only 30 men at the time of the fire.

The Pittsburg Plate Glass Company will soon begin the erection of a large factory at Ford City, Pa. The main building will be 143x700 ft., steel frame, brick curtain walls and slate roof. It will be equipped with new machinery. Mr. Crookshank is engineer for the company.

The general offices of the National Association of Manufacturers, including the office of the President, Theodore C. Search, have been removed from No. 1743 North 4th street to the Bourse, Philadelphia.

#### Iron and Steel.

The plant formerly run by the Glover Foundry Company, of New Castle, Pa., will hereafter be operated under the name of Green, Glover & Company.

The Beloit Iron Works, Beloit, Wis., have increased their capital stock from \$10,000 to \$136,000.

At a meeting of the American Association of Iron and Sheet Steel Manufacturers, held in Pittsburg, Feb. 8, the Secretary advised the manufacturers that the prices showed an upward tendency and that it would be wise to take all orders contingent on the advance of prices that must necessarily follow the increased demand.

Henry Knoth has been appointed Superintendent of the plant of the Burgess Iron & Steel Co., Portsmouth, O.

We understand that the Pennsylvania Steel Works is now employing 1,172 more men than at this time a year ago. These employees are making full time and many of them extra time, whereas a year ago they only averaged three full days a week.

The Columbus Forge & Iron Co., Columbus, O., has been incorporated by David Buel, W. W. Franklin, E. C. Humphreys, B. N. Huntington and others.

#### New Stations and Shops.

There is some talk of the Wabash building a new station at Decatur, Ill., but as yet nothing definite has been decided on.

#### The Anti-Scalping Bill.

The American Association of General Passenger and Ticket Agents, at a special meeting in Washington, D. C., Feb. 14, about 100 members being present, unanimously adopted the following:

Whereas, The impression has been given out that the passage of the Anti-Scalping bill now before Congress is favored only by a few transportation lines of the country; therefore, be it

Resolved, That we express our earnest belief in the necessity for national legislation on this question, and respectfully urge upon our Representatives in Congress that immediate and favorable action be taken upon this measure, which has our unqualified indorsement, as being in the interests of the general public, as well as of the transportation lines.

The bill is now on the House calendar, and may be taken up at any time under the call of committee. Petitions for and against it from all sections of the country are presented every day.

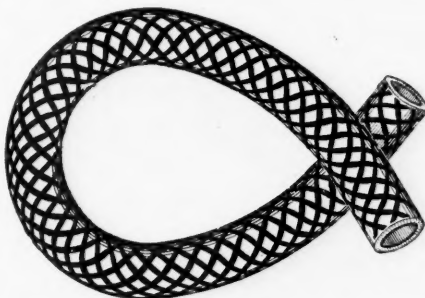
#### Contracts for Signals for a Year.

The Long Island Railroad Company has made a contract with the Standard Railroad Signal Company, of Arlington, N. J., to furnish all signal material that may be required by the road for the next twelve months.

The Standard Company has also taken a contract for two interlocking plants for the Chicago & Northwestern, at Belle Plaine, Ia. One of the machines has 15 working levers and 5 spare spaces, and the other has 12 levers and 4 spaces.

#### Metallic Flexible Tubing.

The Metallic Flexible Tubing Co., 254 South Second Street, Philadelphia, Pa., has put on the market an interwoven metallic flexible tubing for protecting and strengthening rubber hose, as is shown by the cut. The tubing is made of tempered flat steel wire, galvanized to prevent corrosion, and may be applied by drawing it over the hose and securing the ends by a piece of wire. The advantages claimed are: Protection of the surface of the rubber from abra-



sion; allowing an internal pressure of more than 1,000 lbs. to the square mile and preventing unraveling of lbs. to the square inch and preventing unraveling of kinking. The tubing is now being tested by the Pennsylvania, New York Central & Hudson River, Great Northern, Erie, Baltimore & Ohio and several other railroads.

#### The New East River Bridge.

The first report of the new board of commissioners of the new East River bridge shows that the disbursements up to January 31 amounted to \$990,066.61, and there is a balance on hand of \$84,583.39.

#### Department of Electricity, Chicago.

The organization of the new Department of Electricity at Chicago, mentioned in our issue of Feb. 4, has now been completed. Edward B. Ellicott is City Electrician; David M. Hyland, Assistant City Electrician; William Carroll, Superintendent of Construction; J. B. Porter, Chief Clerk, and R. M. Johnson, Chief Inspector. There are also nine inspectors and the old force of operators. The principal features of the new policy as outlined by City Electrician Ellicott are as follows:

"Continued careful investigation of the street railroads and requiring correction of the faults causing damage to pipes my electrolysis; rigid enforcement of the ordinance regarding the electrical inspection of wiring inside of buildings; adoption of every possible means of decreasing the cost of municipal lighting; enforcement of ordinances requiring wires to be put underground within a reasonable district; putting all important fire-alarm and police lines underground; requiring combination pole lines and removing unnecessary poles; extension of municipal electric lighting; improving the police telephone system and decreasing the cost of operation."

The special appropriation of \$150,000 for electric street lighting will, it is expected, be included in the general municipal appropriation bill now being considered.

#### The Illinois Steel Company.

In the annual report of President Gates, he says that the year just closed saw the largest production of iron and steel in the history of the United States. The Illinois Steel Company produced from 1,100,000 to 1,200,000 tons of pig and spiegeleisen and about

1,000,000 tons of finished steel. All the furnaces of the company are in blast and the workmen are steadily employed. Mr. Gates reports that the deficit of 1896 has been more than wiped out this year. The only change in the Board of Direction was that Mr. J. L. Ellwood was succeeded by Mr. Elbert H. Gary (celebrated as the judge in the Haymarket case). Mr. Gates was re-elected president. The balance sheet shows assets and liabilities as below:

Assets.	
Plants	\$19,920,954.19
Investment in railroad bonds and stocks	3,830,000.00
Investment in coke property	2,781,000.00
Other investments	408,366.57
Materials and supplies	2,970,521.59
Cash	1,002,189.25
Bills receivable	580,898.84
Accounts receivable	4,220,409.56
Total	\$35,714,340.00
Liabilities.	
Capital stock outstanding	\$18,650,635.00
Five per cent. debenture bonds, due in 1910	6,200,000.00
Five per cent. debenture bonds, due in 1913	7,000,000.00
Dividend scrip outstanding, due in 1913	85,142.67
Bills payable (since reduced to \$1,215,000.00)	1,630,000.00
Accounts payable	1,985,457.71
Reserve funds	142,478.72
Profit and loss (surplus)	20,625.90
Total	\$35,714,340.00

#### Steamers Building at Elizabeth.

The Crescent Ship Yard, at Elizabethport, N. J. (Lewis Nixon, Manager), has now on the stocks or orders booked for 17 steamboats of various sizes. Quite a number of these are for the Yukon and to trade between Seattle and the Upper Yukon. One of them is a side-wheel boat, 40 ft. long and 8 ft. beam, designed to run on 6 in. of water. Another one is a 75-ft. screw boat, with six screws, all aft in one horizontal plane, working in a well, essentially as do the twin screws of Yarrows gun-boats for the Upper Nile. In the Nixon boat the screws are 40 in. diameter and can be immersed in 30 in. of water. The reader will perhaps remember the arrangement on the Yarrow boats. The well in which the screw works is immediately, on starting the screw, pumped full of water, which immerses the whole screw, although the upper part of the screw is really above the water level of the stream. In the Nixon boat each of these six screws is driven by an independent, compound, condensing engine. Water-tube boilers are used with a steam pressure of 200 lbs. per square inch.

#### Tests of the Columbia Chainless Wheel Bicycle.

Professor J. E. Denton, of Stevens Institute, has made very complete tests of the chainless bicycle for the Pope Manufacturing Co. The conclusions from the tests as published in the "Iron Age" are as follows:

1. The results of the investigation show that both the Columbia chainless wheel and the Columbia chain wheel wastes in its propelling mechanism from about 15 per cent. at high speeds (30 miles per hour) and on low grades to 7 per cent. at moderate speeds (13 miles per hour) and on heavy grades of the power applied at the cranks by a rider weighing about 180 lbs., provided the chain of the chain wheel is clean and well lubricated. Any difference of efficiency of the two styles of propelling mechanism with a clean lubricated chain is equalled by the difference liable to exist in the power absorbed by two tires of the same grade, which is about 1 per cent. of the average power expended by a rider.

2. It is probable that the efficiency shown by the chainless wheels in the tests will be maintained for long periods of road use without any cleaning or lubrication of the mechanism, but the efficiency of the chain wheels, after a short road use, may be considerably less than that shown by the tests by the soiling of the chain.

3. The tests of other makes of chainless wheels show that differences in the power wasted by different constructions of tire and by lack or proper stiffness of frame combined with an arrangement of the gears whose efficiency is affected by the distortion of the frame by crank thrust, may make the waste of power reach 50 per cent. of the energy applied to some chainless wheels at high speeds on low grades.

#### Nickel Steel Firebox.

The Prussian government railroads are going to try a firebox of nickel steel 7 mm. thick, which will cost nearly the same as the copper firebox 16 mm. thick. They will also try staybolts of nickel steel instead of copper.

#### THE SCRAP HEAP.

##### Notes.

The president of the Illinois Central has notified employees to refrain from making presents to officers of the company.

The burnt-out Fairview tunnel of the Santa Fe Pacific, near Ash Fork, Ariz., was repaired, so that trains ran through it on Feb. 11.

A. M. Hoerner, for the past six years Chief Clerk in the office of the Missouri & Kansas Car Service Association, has been appointed by the Executive Committee of the Association as Temporary Manager to fill the vacancy caused by the death of President and Manager A. P. Wilder. (See these columns for last week.)

The composite steam locomotive and passenger car that has been built for the New England Railroad was tried, on the main line, near Boston, on Feb. 10. On a straight, level track the car was run one mile, starting from a state of rest and coming to a full stop at the end of the mile, in 1 minute 59 2-5 seconds. Other tests were made. The car was run easily at 35 miles an hour, and in some of the tests made as high as 43 miles an hour.

The passengers in the smoking car of a through train on the St. Louis, Iron Mountain & Southern near Bismarck, Mo., last Saturday morning were at-



tacked by two robbers, who had boarded the train at St. Louis. One of the passengers at once stopped the train, and the robbers were repulsed before they got much money. When they saw that the passengers and trainmen were braver than themselves they got off the train and escaped.

#### A London Universal Exposition.

A "Universal Exposition" will be held from May to October, this year, on the Exposition Grounds of Earl's Court, London. The Director-General is Mr. Imre Kiralfy, and it is intended to illustrate the latest achievements in inventions, manufactures, industries and applied arts.

Americans desiring to exhibit should write to Mr. A. Macchi at the Exhibition Grounds, Earl's Court, London, S. W. Mr. Macchi was a member of the Board of Judges at the World's Columbian Exposition, Chicago, 1893, and Commissioner at the Expositions at San Francisco and at Atlanta, and also was lately Chief of the Foreign Department at the Tennessee Centennial Exposition, Nashville.

#### Purdue Lectures.

Mr. G. W. Rhodes, Superintendent of Motive Power of the Chicago, Burlington & Quincy, will address the engineering students of Purdue University on "Experiences in the Motive Power Departments of Railroads," Friday, Feb. 18.

#### The Foreign Commerce of Japan.

In its issue of Jan. 28 "Engineering" (London) prints a long article on Japanese trade, made up principally from a report by a British Consul, Mr. Brennan. From the tables given there we compile the following, showing the totals of imports and exports and the imports and exports to and from several countries. The values are given in millions of yen. The value of the yen is: Nominal, 4s.; actual, 3s. 4d., or, say, 80 cents.

	Imports from	1894.	1895.	1896.
Total	1894.	121.1	129.3	171.7
Great Britain	42.2	45.2	59.3	
United States	11.0	9.3	16.4	
Germany	8.0	12.2	17.2	
France	4.3	5.2	7.8	
India	10.6	12.0	22.5	
Total	Exports to	112.2	136.1	130.4
Great Britain	6.0	7.9	9.0	
United States	43.3	54.0	31.5	
Germany	1.5	3.3	3.0	
France	19.5	22.0	19.0	
India	3.7	4.4	4.5	

The following table gives a few of the principal items of import by countries, with their values also in yen:

	1890.	1896.
Great Britain:		
Machinery	2,361,000	4,586,000
Locomotives	475,000	1,054,000
Steam boilers and engines	254,000	717,000
Steamships	616,000	1,315,000
Pig iron	86,000	633,000
Rails	894,000	2,029,000
Manufactured iron	1,140,000	2,633,000
Steel	162,000	634,000
Cotton yarn	6,374,000	11,093,000
Cotton manufactures	4,076,000	11,610,000
Woolen manufactures	3,510,000	7,923,000
Germany:		
Iron nails	356,000	930,000
Steel	4,000	117,000
Woolen manufactures	1,330,000	5,239,000
United States:		
Locomotives	48,000	416,000
Machinery	364,000	688,000
Iron nails	1,300	232,000
Kerosene oil	4,214,000	5,282,000
Raw cotton	352,000	4,252,000
China:		
Raw cotton	2,665,000	8,158,000
India:		
Raw cotton	1,114,000	19,245,000

#### South American Notes.

The South American Railroad Construction Co. of Jersey City, N. J., was incorporated in New Jersey, Feb. 10, with a capital stock of \$50,000. The incorporators are George Hoatley, C. H. Sherrill, Charles H. Lee, New York; Archer Hammond, Louisville, Ky.; and T. H. Powers Farr, West Orange, N. J.

#### Proposed Railroad Legislation.

Senator Kyle has introduced in Congress a bill repealing the arbitration law of 1888 and prescribing a revised code of regulations for arbitration between interstate railroads and their employees. Street railroads are expressly exempted. In the house, a bill has been introduced to punish train wrecking with intent to rob. The penalty prescribed is death or 10 years of imprisonment. The lower House of Congress has rejected a bill to allow the Baltimore & Potomac to establish cab service at its station in Washington. The rejection was carried on the argument that the company sought to secure a monopoly.

The proposition to establish a State Railroad Commission in New Jersey has been rejected by the Legislature. In Kentucky the McCord bill, to regulate freight rates throughout the State, has been passed by both houses of the Legislature, but, according to press dispatches, the Governor will not sign it. It is believed, however, that the majority in favor of the bill will be sufficient to pass the bill over a veto.

The bill empowers the Railroad Commission to designate the maximum freight rate between any two points in the State whenever complaint is made, and penalties are provided to compel railroads to accept whatever rates are made by the Commission.

The South Carolina Legislature has refused to repeal the existing law forbidding the issue of free railroad passes to members of the Legislature.

In the New York Legislature a number of bills have been introduced embodying the recommendations recently made by the State Railroad Commissioners in their annual report. Another bill permits savings banks to invest a portion of their funds in certain bonds of railroad companies.

The Legislature of Iowa has passed a bill authorizing the Railroad Commissioners to extend the time for equipping freight cars with safety couplers, but not for more than one year. The "Temple amendment," intended to kill the Burlington Relief Department, which has been pending in Iowa for some time, is said to be sure of passage within a short time.

#### Brazilian Railroads.

Mr. Frank D. Hill, United States Consul at Santos, has made a special report on the railroads of Brazil to the State Department. The number of miles open

to traffic and under construction Dec. 31, 1896, were as follows:

	Open.	Building.
Federal Government lines	1,982	.....
Subventioned lines (subject to Government inspection)	2,430	3,699
Lines not subventioned	990	384
Lines operated by the State	3,260	880
Total	8,662	4,963

Of the first class, or railroads, belonging to the Federal Government, the total extension of 3,190 kilometers (1,982 miles) represents an effective capital of 324,733,121 milreis (\$45,462,637), divided as follows:

Lines.	Open.	Capital.
Central of Brazil	758	\$25,056,988
Sobral	134	1,306,526
Baturite	296	2,014,876
San Francisco	280	2,357,406
Central of Pernambuco	112	4,692,285
Paulo Afonso	69	955,003
Porto Alegre to Uruguay	285	3,840,543
Rio de Oro	54	345,103
Unaccounted for by the Consul	124	4,393,907
Total	1,982	\$45,462,637

#### British and German Shipping.

We find it stated that, "roughly speaking, the German Empire possessed in 1871 4,500 ships, with a tonnage of 1,000,000; by 1897 the number had fallen to 2,700, but the tonnage had risen to 1,650,000. In the former year there were 150 steamers of 82,000 tons, and 4,350 sailing ships of 900,000 tons; in the latter there were 1,125 steamers of 900,000 tons, and 2,550 sailing vessels of 600,000 tons; and calculating, as is usual, a steam ton as equal to three sailing tons, we obtain a total capacity in 1897 of about 3,000,000 tons." As has already been shown, a comparison with 1871 is not to be relied upon. Dealing, however, with the figures as presented, it may be well to set against them similar statistics in regard to the shipping of the United Kingdom. Between the beginning of 1871 and 1897 the increase in our merchant navy was from 5,691,000 tons to 9,020,000 tons, as compared with an increase in the German merchant navy from 1,000,000 to 1,650,000. And taking the same estimate of one steam ton as equal to three sailing tons, while the effective carrying capacity of the German mercantile navy increased from 1,150,000 tons to 3,300,000 tons, the capacity of that of the United Kingdom increased from 7,900,000 tons to 21,600,000 tons. In this branch of foreign commerce—the sea carrying trade—there can be no question as to which of the two countries has been the more progressive.—"The Economist."

#### LOCOMOTIVE BUILDING.

It is reported that the Indiana & Illinois Southern will buy some locomotives.

The Indianapolis Union is asking bids for two six-wheel connected shifting engines of 110,000 lbs. weight and 180 lbs. boiler pressure.

The Baldwin Locomotive Works have completed 22 locomotives for the Finland State Railway, the order for which we noted last November.

Last week we noted that the Kansas City Belt is in the market for two switching locomotives. They will be built after specifications prepared by M. J. Rogers, Master Mechanic.

The Southern Indiana has placed an order with the Baldwin Locomotive Works for four 10 wheel freight locomotives. We noted two weeks ago that this order was about to be placed.

The Philadelphia & Reading has practically given a contract to the Baldwin Locomotive Works for nine heavy freight and six heavy fast passenger locomotives, but no formal order has been given.

The Brooks Locomotive Works, Dunkirk, N. Y., have shipped the first of the order for six six-wheel switching locomotives for the Cleveland, Cincinnati, Chicago & St. Louis, which order we noted last December.

In order to secure more power the Chicago & Northwestern has recently rented some locomotives from the Omaha Line. It has been reported recently that the Chicago & Northwestern was again in the market for engines, but we are officially informed that it is not probable that any further orders will be placed during this fiscal year, which terminates in May next.

#### CAR BUILDING.

The Chicago, Lake Shore & Eastern is about to order 250 freight cars. The order may possibly be increased to 500.

The Pennsylvania is having three new dining cars built by Pullman Palace Car Co., for the New York-Washington run.

The Glucose Sugar Refining Co., of Chicago, has ordered from the Wells & French Co., Chicago, 100 tank cars. This order may be increased to 200.

The Harlem & Hollingsworth Co., Wilmington, Del., has received an order from the Baltimore, Chesapeake & Atlantic for three passenger cars.

The Jackson & Sharp Co., Wilmington, Del., is furnishing the Georgia Pine Railway with one 50 ft. passenger coach and one combination passenger and mail car of the same length.

Orders have been placed for the 500 cars for the Louisville, Evansville & St. Louis Ry., which were mentioned in our issue of Feb. 4, the Ohio Falls Car Co. having received the order for 200 coal cars and the Missouri Car & Foundry Co. for 300 box cars.

The Lake Superior & Ishpeming has ordered 40 steel cars of 160,000 lbs. capacity from the Schoen Pressed Steel Co.

We are officially informed that the Kansas City, Memphis & Birmingham is not in the market for fifty new coal cars, as rumored last week. This report probably became confused with the fifty new flat cars about to be ordered by the Kansas City, Fort Scott & Memphis. These cars are to be 50,000 lbs. capacity, 40 ft. long, 8 ft. 8 in. wide, and will be equipped with American steel body and truck bolsters, Tower couplers, Westinghouse air brakes, Marden brake beams and malleable iron journal boxes.

#### BRIDGE BUILDING.

BOSTON, MASS.—City Engineer William Jackson

has completed plans for a new bridge, to be built from Cambridge street, Boston, to Main street, Cambridge. This bridge will take the place of the present wooden pile bridge originally built in 1792 and rebuilt in 1854. The new structure will be 90 ft. wide and 1,815 ft. long. It will have 18 spans, each 88 ft. wide, nine on each side of the draw. The draw will be steel, 240 ft. span; roadway, granite block; sidewalks, 10 ft. wide, asphalt. Tracks for the surface cars will be in the center of the roadway, and over them, 19 ft. above the grade of the bridge, will be built double tracks for elevated trains. The estimated cost is \$1,250,000, to be borne equally by Boston and Cambridge.

COLUMBUS, O.—Press reports state that a bridge is being talked of at Main street which would cost about \$50,000.

CONNEAUT, O.—The Ashtabula County Commissioners will build a new bridge at Conneaut.

COPPOCK, IA.—A movement is on foot to build a bridge over the Skunk River, at the junction of Henry, Washington and Jefferson counties, near Coppock.

DULUTH, MINN.—It is stated that the District Court has ordered the St. Paul & Duluth and the Northern Pacific to build a bridge over their tracks on Garfield avenue, in the West End. It is estimated that the cost would be \$140,000. An appeal will be taken by the roads.

ELKTON, Pa.—The County Commissioners, Cecil County, will build a bridge about two miles from Perryville. The Commissioners recently awarded a contract for building the bridge over Bossie Run to the West Virginia Bridge Co.

FORT DODGE, IA.—A new bridge will be built between sections 11 and 12, Johnson Township.

MOUNT VERNON, N. Y.—Press reports state that the Railroad Commissioners have decided favorably on the petition of the Mayor and Aldermen for bridges across the New York, New Haven & Hartford Railroad at Third and Tenth avenues.

OMAHA, NEB.—Senator Thurston's bill requiring the bridge across the Missouri River at Omaha, has been favorably reported by the Senate Committee on Commerce.

OTTAWA, ONT.—Preparations are under way for beginning work on the bridge across the Ottawa River, from Nepean Point, in Ottawa, to the city of Hull. The Dominion Bridge Co. of Lachine, will build the superstructure. The bridge will be about 1,300 ft. long and will carry two steam railroad tracks and two electric railroad tracks and a 16-ft. roadway on each side. The total cost is estimated at about \$750,000.

PEKIN, ILL.—It is stated that bids were opened for the new Peoria & Pekin bridge Feb. 10, but no awards were made—only two bids were submitted. Estimated cost of this bridge is \$40,000.

QUEBEC, CAN.—The Quebec Bridge Co. has presented plans for approval to the Railway Committee of the Privy Council for the proposed bridge across the St. Lawrence River at Quebec. The bridge will be 150 ft. above high water mark and will have a span of 1,000 ft. between the center piers.

RIALTO, O.—It is stated the County Commissioners, Butler County, have instructed Engineer Dillon to prepare plans for a new bridge at this place to take the place of the one recently destroyed. It will be a swing bridge of improved design.

SAGINAW, Mich.—A resolution will be presented at an early meeting of the City Council for the building of a new bridge at Genesee street. H. E. Terry, City Engineer.

SOBER, Pa.—The County Commissioners, Centre County, have decided to build a new iron bridge over Peen's Creek at this place. Jesse Cleaver, County Surveyor, Bellefonte.

SYRACUSE, N. Y.—A bill has been introduced in the Assembly by Senator White authorizing the city to raise \$15,000 for a bridge over Onondago Creek at West Water St.

TERRE HAUTE, Ind.—The Evansville & Terre Haute Railroad Co. offers to build at its own expense two viaducts over its tracks at two street crossings, the opening of one of which has been a subject of controversy for many years. The Council will take action on the proposition at an early meeting.

VERDUN, P. Q.—A committee of prominent citizens of Verdun and Ste. Cunegonde, among whom were Mayor Hadley, of Verdun, and ex-Mayor Luttrell, of Ste. Cunegonde, have petitioned the Canadian Government to build a bridge over the Lachine.

WALKERTON, ONT.—James Warren, C. E., has prepared plans for a steel bridge to be erected at Tara, Ont., to be 100 ft. in length.

WOODLAWN, O.—The question of a bridge which has been agitated at Woodlawn has been referred to the County Commissioners of Hamilton County. Frank S. Krug, Engineer, Cincinnati.

#### RAILROAD LAW—RECENT DECISIONS.

It is decided in Wisconsin that where a new highway is opened by a municipality, across a railroad track, the company is entitled to compensation for making and maintaining such structural changes in its roadbed and track as are thereby rendered necessary, but not for such changes as it makes to meet the requirements of law under the police power of the state; that is to say, speaking generally, the power of the legislature to enact all reasonable regulations conducive to the health, comfort and safety of society and of the individual members thereof. The exercise of this power is not in any sense an impairment of the contract entered into by the state when it grants a franchise, and so within the inhibition of the constitution, and duties imposed under it afford no right to compensation. Thus, for example, the plaintiff in this case is held entitled to recover the cost of planking its track and maintaining the planking, that being deemed a part of railroad construction at highway crossings, necessary for the protection of the track, but it cannot recover for the construction and maintenance of cattle guards, crossing gates or crossings signs (decided by the Supreme Court, November, 1897).<sup>1</sup>



The court also holds the plaintiff to be entitled to damages for the diminished value of its property in the land taken for the purpose of the highway, thereby declining to follow the rule recently asserted by the United States Supreme Court, which denies the existence of such an element of damage,<sup>2</sup> and on the contrary adopting the Massachusetts doctrine.<sup>3</sup>

Although, as a rule, a railroad company in New Jersey is required only to maintain such safeguards at its crossings and to give such signals of the approach of trains thereto as are prescribed by the legislature, it must take such additional precautions as the circumstances reasonably call for, where the crossing has some peculiarly dangerous feature unnecessarily occasioned by the act of the company itself. As, for example, where a railroad company, for its own convenience, curves its track as it leaves a deep cut, within a few feet of a highway, and also puts up buildings near the track and by these means, or either of them, increases the danger in the use of such highway (decided by the Supreme Court, November, 1897).<sup>4</sup>

A township ordinance, enacted by authority of the New Jersey legislature, provides that no person shall cut or break any tree standing on any public street or highway in the said township, without permission from the Township Committee. Certain employees of an electric railroad company had been convicted under this ordinance and on a proceeding to test the validity of the same it was contended that the grant to the company of power to operate its road carried with it, *ipso facto*, the right to cut the trees so far as was necessary for that purpose. It is held that this contention was without merit, that the ordinance was a valid one and applicable to the company and that the convictions must be affirmed (decided by the Supreme Court, November, 1897).<sup>5</sup>

In Kentucky, a passenger who sits by an open window with knowledge of the fact that sparks and cinders are entering the window, cannot recover for injuries resulting therefrom, on the ground that the company was negligent in allowing the window to be out of repair, so that it could not be closed, if he knew, or by the exercise of reasonable care could have known that there were unoccupied seats, with windows in order (decided by the Court of Appeals, October, 1897).<sup>6</sup>

In Michigan a person who does not see an approaching train, ordinarily visible for a sufficient distance, in time to escape collision with it, because the sun is in his eyes, is not excused from taking other reasonable precautions to avoid the accident. As in the case of any other obstruction to sight, it is his duty to stop and listen before attempting to cross. Accordingly, it is held that an action for personal injury arising under these circumstances cannot be successfully maintained (decided by the Supreme Court, November, 1897).<sup>7</sup>

In an action decided in Texas, brought to recover damages for personal injuries, it appeared that the plaintiff had caught a train on defendant railroad just as it was leaving a station, getting on board between the baggage car and the tender because he had no time to get on elsewhere, the train being in rapid motion. He had no ticket, but was prepared to pay his fare and intended to pay it. The fireman began to throw hot water upon him and continued to do so until he jumped off, breaking his leg. It is held that he merely stood in the relation of a trespasser to the company and was not entitled to the privileges and protection due to a passenger, there being no contract express or implied constituting him a passenger (decided by the Supreme Court, November, 1897).<sup>8</sup> The court does not discuss the liability of the company to a trespasser under the circumstances.

In an action decided in South Carolina, in which the circumstances were practically the same as those proved on the trial of the case noted in the last paragraph, except that the plaintiff had a ticket, the court holds that the question whether he was a trespasser or a passenger was for the jury to decide. The fact that he boarded the train at a place where passengers were not usually received did not *per se* make him a trespasser. The court further holds, as a matter of law, that he was entitled to the rights of a passenger, at least so far that the employees of the defendant were bound to refrain from violence toward him (decided by the Supreme Court, November, 1897).<sup>9</sup>

In Rhode Island it is declared not to be negligence, furnishing ground on which an action by one injured thereby can be maintained, where a railroad fails to remove spindles from the drawbars of cars when inspecting them, unless such a method of inspection is proved to be customary or to be considered essential to safety by prudent men engaged in the operation of trains (decided by the Supreme Court, May, 1897).<sup>10</sup>

<sup>1</sup> C. M. & St. P. vs. Milwaukee, 72 N. W., 1118.

<sup>2</sup> C. B. & Q. vs. Chicago, 166 U. S., 226.

<sup>3</sup> B. & A. vs. Cambridge, 159 Mass., 283.

<sup>4</sup> P. & R. vs. State, 38 Atl., 820.

<sup>5</sup> State ex. rel. Traction Co. vs. East Orange et. al., 38 Atl., 802.

<sup>6</sup> O'Donnell vs. Louisville & N., 42 S. W., 846.

<sup>7</sup> Osborn vs. Detroit, G. H. & M., 72 N. W., 1114.

<sup>8</sup> M. K. & T. vs. Williams, 42 S. W., 855.

<sup>9</sup> Martin vs. Southern, 28 S. E., 303.

<sup>10</sup> Burns vs. N. Y., P. & B., 38 Atl., 926.

## MEETINGS AND ANNOUNCEMENTS.

### Dividends.

Mexican Northern, quarterly, 1 per cent., payable March 1.

North Pennsylvania, quarterly, 2 per cent., payable Feb. 25.

Cleveland & Pittsburg, quarterly, guaranteed, 1 1/2 per cent., payable March 1.

### The Traveling Engineers' Association.

The question of changing the date of the annual meetings of the Traveling Engineers' Association was decided by letter ballot, the polls closing Jan. 1, 1898. The result of the ballot was a majority in favor of holding the annual meetings the second Tuesday in September, the same as heretofore.

### Western Society of Engineers.

A meeting of the Western Society of Engineers was held Wednesday evening, Feb. 16, in the society rooms, Monadnock Block, Chicago. Mr. Victor Windett of the Illinois Steel Company presented a paper describing the South Works of that company at Chicago, and the methods of handling materials and the process used in the manufacture of steel.

### Civil Engineers' Society of St. Paul.

A regular meeting of the Civil Engineers' Society of St. Paul was held at 8 p. m., President Estabrook in the chair. The discussion of a programme for the current year resulted in continuing with the president the responsibility of providing matter for each evening's consideration.

The president read an illustrated paper on "Mining Pennsylvania Anthracite Coal Thirty Years Ago."

### Western Railway Club.

A meeting of the Western Railway Club was held Tuesday, Feb. 15, at the Auditorium Hotel, Chicago. The following papers were presented and discussed: "Nickel Steel for Crank Pins and Axles," by Mr. H. F. J. Porter of the Bethlehem Iron Co. and "The Coffin Toughening Process," by Mr. L. R. Pomeroy of the Cambria Iron Co. The following topics were also discussed: "Can steel be safely used for coupling links?" "Is the present air-brake angle cock, or stop cock, to which the air hose is attached a safe device?" "When 'double-headers' are used on passenger or freight trains, is it good practice to cut out the brakes on the forward engine, and can such practice be regarded as conforming with the law?"

### The Engineers' Club.

On Thursday night of last week the tenth anniversary of the establishment of the Engineers' Club in New York was celebrated by a dinner. Mr. John Thomson, the president of the club, was in the chair, and there was a large attendance, and that the occasion was enjoyed is sufficiently indicated by the fact that the guests did not separate until some time after midnight. The club has had a prosperous career, having lived within its income and having established itself comfortably, and even elegantly, in a house on Fifth avenue. The membership is now something over 720. Although its name is "The Engineers' Club," the first article of the constitution says, "The Engineers' Club shall be composed of engineers and others who may be interested in or connected with the engineering profession," which gives a pretty broad field. The engineers predominate and set the standard, but the membership includes manufacturers, patent lawyers and others of allied interests.

### Engineers' Club of Cincinnati.

The secretary's report for the year ending December 23 gives the following list of papers read during the year:

Some Notes on Testing Cement, W. M. Hall;  
The Use of Concrete in Superstructure, A. O. Elzner;  
The Value and Sufficiency of Plans for an Improved Water Supply for Cincinnati when made regardless of the Physical, Biological and Chemical conditions of the Ohio River, George Hornung;

A Review of the Report of the Engineer Commission in so far as it relates to the Drift Deposit of the Ohio Valley considered as a probable source of water supply, M. D. Burke;

Some recent Discussions of the Water-Works Problem for Cincinnati, S. Whinery;

The Union Passenger Station at Columbus, O., Paul Starritt;

Concrete Piers for Main Street Bridge across the Arkansas River at Little Rock, Ark., R. L. Engle;

The Dwelling House from a Sanitary Point of View, A. O. Elzner;

Methods of making Short Surveys of the Ohio River, C. H. Meeds;

Rebuilding Foundations of Bridge No. 135, on the Chicago Division, C. C. C. & St. L. Ry., W. E. Poland;

The Fohle Air Lift on the C. C. C. & St. L. Ry., S. Hazard;

Replacing Rollers under the 300 feet and 515 feet Spans of the Ohio River Bridge on the Cincinnati Southern Railway, H. E. Warrington;

Annual Address, C. E. Lindsay.

Mr. M. D. Burke also presented at the September meeting a paper on the Water-Works questions for Cincinnati, in reply to discussions on the subject at the April meeting.

On the evening of April 29 an informal farewell dinner was tendered to Mr. S. Whinery on the occasion of his leaving Cincinnati to take up his business and residence in New York City. A testimonial consisting of a Rookwood vase, as a token of remembrance of his fellow engineers, and as a souvenir of Cincinnati, was presented to him.

Mr. S. Whinery having resigned as a member of the Executive Board, Mr. Thos. B. Punshon was on June 17 elected to serve the unexpired term.

The membership is 118.

### The Civil Engineers' Club, of Cleveland.

A regular meeting was held in the room of the club in Case Library on Tuesday, Feb. 8, at 7.45 p. m., with President Ritchie in the chair; present, 38 members and two visitors.

The report of the Committee on New Quarters was presented and read by the secretary. It was ordered that the report be received and printed, and made the subject of a special meeting to be called by the President.

Mr. Walter C. Parmley read a paper entitled "Rainfall and Run-off in Relation to Sewerage Problems." It was an elaborate discussion of the theory of sewer discharge, combined with many practical suggestions from actual experience. He exhibited a number of charts indicating the character, intensity and duration of storms as recorded in different parts of the country, showing that those of greatest maximum for short periods may not always tax the sewers so much as others of a more steady downfall. He showed the importance of considering the direction of the flow in sewers in relation to the direction of the movement of prevailing storms. Where the directions coincide the sewers are more heavily taxed than in other cases. He suggested some new mathematical expressions for the time required for storm water to pass through a sewer of varying diameters. He proposed to increase the exponent of the area A in the formula for discharge of sewers from 4-5, as commonly used, to 5-6, which gives a relatively larger discharge for large drainage areas, while giving about the same results for small areas, and agrees better with the experience in the city of Cleveland.

The paper was discussed by Messrs. M. E. Rawson and C. G. Force, Jr., members of the club.

Mr. Ambrose Swasey presented to the club two large framed photographs of the Forth bridge, of Scotland. One of these showing the bridge in course of construction is now exceedingly rare and valuable. Mr. Swasey remarked on the impressively large dimensions of this bridge, the three main cantilevers aggregating a length of 5,300 feet, the posts of the steel towers being 12 feet in diameter and 300 feet high above the masonry. On his late visit to the bridge he found 50 men engaged in painting it, and was informed that it would require three years for them to finish the job and that it would consume 150 tons of paint.

## PERSONAL.

—Mr. Charles E. Watts, heretofore Contracting Freight Agent of the Delaware, Lackawanna & Western in Buffalo, died at his home in that city Feb. 6 at the age of 43.

—Mr. L. L. Buck, Chief Engineer of the new East River bridge and the Niagara arch bridges, is acting as Consulting Engineer in connection with the work on the Brooklyn dry dock.

—Mr. B. Moe, heretofore Land Commissioner of the Northwest District of the Illinois Central, died at his home in Chicago, Ill., Feb. 10. Mr. Moe was at one time Paymaster of the Illinois Central.

—Mr. C. C. Martin, long known as Chief Engineer and Superintendent of the New York & Brooklyn Bridge, has been appointed Engineer of Bridges for the Boroughs of Brooklyn and Queens.

—Mr. Jake Waterman, formerly General Freight Agent of the Colorado Midland, is reported to have died recently in Johannesburg, South Africa, where he was Superintendent of the street railroads.

—Mr. A. D. Wilder, Superintendent of the Pacific Division of the Southern Pacific, died at his home in Oakdale, Cal., Feb. 14, at the age of 55. Mr. Wilder had been with the Southern Pacific for 25 years in different positions.

—Mr. Benjamin H. Helm, heretofore Contracting Freight Agent of the Louisville & Nashville at New Orleans, La., has resigned his position to become Commissioner of the New Orleans Bureau of Freight and Transportation.

## ELECTIONS AND APPOINTMENTS.

Astoria & Columbia River.—T. H. Curtis has been appointed General Manager with headquarters at Astoria, Ore., and John McGuire has been appointed Superintendent with headquarters at the same place.

Atchison, Topeka & Santa Fe.—Charles C. Hillhouse, heretofore Commercial Agent for the Freight Department, with offices at Peoria, Ill., has resigned, resignation to take effect at once. Mr. Hillhouse hereafter will be the Traffic Manager of the Studebaker Wagon Co. of South Bend, Ind.

Atlantic Coast Line.—The new officers of the Charleston & Western Carolina, recently purchased by the Atlantic Coast Line, are as follows: Vice-President, H. Walters, President of the Atlantic Coast Line; Treasurer, J. F. Post, Secretary and Treasurer of the Atlantic Coast Line, with offices at Wilmington, N. C.; Secretary, J. J. Melligan, with office at Baltimore, Md.; General Auditor, W. A. Riach, with office at Wilmington, N. C.; Cashier, E. W. Mills, heretofore Auditor of the Charleston & Western Carolina, office at Augusta, Ga.; General Manager, J. R. Kenly, General Manager of the Atlantic Coast Line, with office at Wilmington, N. C.; Traffic Manager, T. M. Emerson, with office at Wilmington, N. C. The changes took effect Feb. 1. (See this column for last week.)

Augusta Southwestern.—At a meeting of the stockholders of this company, whose incorporation was noted in these columns for last week, recently held in Augusta, Ga., James U. Jackson was elected President.

Baltimore & Ohio.—J. A. Murray, at present Coal and Coke Agent, has been appointed General Coal and Coke Agent of the entire system, with headquarters at Baltimore, Md. William L. Andrews has been appointed Coal and Coke Agent for the Pittsburgh District, with headquarters at Pittsburgh, Pa. E. T. Affleck, Coal and Coke Agent for the lines west of the Ohio River, with headquarters at Columbus, Ohio, has been appointed Assistant Coal and Coke Agent for that territory. Edward S. King, Commercial Freight Agent at Baltimore, has been transferred to Philadelphia, Pa., with the same title and duties. He will be succeeded in Baltimore by H. W. Atkinson, who is now Chief Clerk to General Freight Agent T. W. Galleher. The changes and appointments take effect March 1.

Canadian Pacific.—Herbert Carter has been appointed General Freight and Passenger Agent to look after the Canadian Pacific's interests in the Klondike. His headquarters will be at Skaguay, Alaska. Fred J. Baker will be associated with Mr. Carter in looking after the business at that point.

Chicago, Rock Island & Pacific.—J. G. Keller, having resigned as General Agent at Pueblo, Colo., T. B. Brasted has been appointed General Agent at that place.

Cincinnati, New Orleans & Texas Pacific.—E. F. Sisson has been appointed Soliciting Agent of the Cincinnati Southern, with headquarters at Chattanooga, Tenn., succeeding E. E. Mack, promoted.

Cumberland Valley & Martinsburg.—At the annual election recently held in Martinsburg, W. Va., Charles W. Kilbourn, of Martinsburg, was elected a director, succeeding A. J. Thomas.

Delaware Valley, Hudson & Lehigh.—At the annual meeting of this company, whose incorporation was noted in these columns last July, held at Stroudsburg, N. Y., Jan. 31, the following Directors were elected: J. B. Lung, C. A. Woolsey, Frank Pettit, J. Kellow of Brooklyn, N. Y.; J. H. Van Etten of Milford, N. Y.; M. F. Coolbaugh, F. W. Eilenberger, W. S. Shafer and J. H. Shull. At a meeting of the Directors held later, the following officers were elected: President, Dr. J. B. Lung; Treasurer, M. F. Coolbaugh, and Secretary, J. H. Shull.

Duluth, Missabe & Northern.—At a meeting of the stockholders held in Duluth, Minn., Feb. 8, Hulett C. Merritt was elected a Director, succeeding George D. Swift.

Erie & Central New York.—At the annual meeting held in Cortlandt, N. Y., Feb. 9, the following Directors were elected, increasing the number from thirteen to fifteen: W. D. Tisdale, C. P. Walrod, H. M. Kellogg, J. S. Squires, Irving H. Palmer, D. F. Wallace, Frank H. Cobb, T. H. Wickwire, C. W. Stoker, Harrison Wells, George H. Holmes, A. P. McGraw, B. R. Corning, M. A. Bundy and W. H. Meserole. At a meeting of the Directors held later the following officers were elected: President, W. D. Tisdale; Vice-President, M. A. Bundy; Secretary, E. T. Kellogg; Treasurer, C. P. Walrod; Attorney, I. H. Palmer; General Manager, M. A. Bundy; Chief Engineer, Walter Meserole.



Evansville & Terre Haute.—William K. Allen has been appointed Assistant Auditor, with headquarters at Evansville, Ind.

Fitchburg.—At a meeting of the Directors held in Boston, Mass., Feb. 15, Edmund Dwight Codman, heretofore Vice-President, was unanimously elected President. The statement made in this column last week, which was quoted from a reliable publication, that C. A. Nimmo had been appointed General Western Passenger Agent with headquarters at Troy, N. Y., is misleading. Mr. Nimmo has held this title for the past eleven years.

Frankfort & Cincinnati.—Joseph R. Newton has been appointed General Assistant Freight and Passenger Agent, with headquarters at Frankfort, Ky.

Guadalupe Valley.—At the annual meeting of this company, whose incorporation was noted in these columns of Dec. 31, held in Victoria, Tex., Feb. 1, F. C. Procter was elected a director, succeeding Hon. J. D. Mitchell, who declined re-election.

Gulf, Beaumont & Kansas City.—J. F. Weed, a Civil Engineer of Houston, Tex., was appointed Feb. 6 Chief Engineer with headquarters at Beaumont, Tex. Mr. Weed was formerly connected with the Land Department of the Southern Pacific and the Houston & Texas Central.

Illinois Central.—L. H. Downs has been appointed Road Master of the third division of the main line, with headquarters at La Salle, Ill., succeeding C. E. Grafton, transferred.

Kansas City, Pittsburgh & Gulf.—Fred. G. Lyons has been appointed Soliciting Agent, with headquarters at New Orleans, La. The appointment is effective at once.

Manahawken & Long Beach.—At the annual election held in Camden, N. J., Feb. 8, A. Hugg and Henry C. Synen were elected directors.

McCloud River.—The officers of this company referred to in another column are as follows: President, W. E. Brown; General Manager, W. W. Van Arsdale, Upton, Cal.; Secretary and Treasurer, George W. Scott, Crocker Building, San Francisco, Cal.; Superintendent, H. Cooley, Upton, Cal.

Mineral Range & Mining Co.—At the annual meeting held in Philadelphia on Feb. 8 Joseph U. Crawford was elected a director, succeeding A. J. Cassatt.

Northern Pacific.—H. W. Sweet, of Buffalo, N. Y., has been appointed District Passenger Agent at Boston, succeeding Frank A. Gross, resigned. The appointment is effective Feb. 15. Frank R. Gross, heretofore District Passenger Agent, with headquarters at Boston, Mass., has resigned, and hereafter will represent the Boston & Alaska Transportation Co. His present position with the Boston & Alaska Transportation Co. is General Passenger and Freight Agent, with offices at 28 South St., New York City, and 256 Washington St., Boston, Mass.

Ontario Despatch.—James Sharpe, formerly agent of the west-bound traffic only, has had his jurisdiction extended to cover traffic in both directions, with headquarters in Chicago, Ill. Mr. Sharpe is also Traffic Agent of the Rome, Watertown & Ogdensburg. (See this column for last week.)

Pennsylvania.—The statement of the appointment of Assistant Purchasing Agent Samuel Porcher as Purchasing Agent, succeeding the late Alfred W. Sumner, is at least premature. No announcement of his appointment has been made.

Rio Grande Western.—W. H. Paul, heretofore General Agent of the Freight Department at Portland, Ore., has resigned to engage in other business.

St. Paul & Duluth.—L. S. Miller having resigned, the office of Assistant General Manager has been abolished, and the duties of that position will hereafter be performed by A. B. Plough, Vice-President and General Manager.

Salt Lake and Ogden.—James M. Kirk has been appointed Master Mechanic, with headquarters at Salt Lake City, Utah, succeeding W. T. Godfrey, recently resigned.

Southern.—George R. Loyall, Superintendent of the Kentucky Division of the Southern, has been appointed Superintendent of the recently purchased Northern Division of the Cumberland & Ohio, operated by the Louisville & Nashville. His headquarters are to be at Louisville, Ky.

Southwestern.—At the annual meeting of this company, which is leased to the Central of Georgia, held at Macon, Ga., Feb. 10, the following Directors were elected: R. T. Wilson, W. G. Raoul, Thos. B. Gresham, J. F. Minis, J. M. Johnston, W. R. Cox and R. H. Brown. At a meeting of the Directors held later, B. A. Denmark was elected President; William G. Raoul Vice-President, and J. M. Walker Secretary and Treasurer, with headquarters at Macon, Ga.

Texas Central.—At the annual meeting recently held in Waco, Texas, Richard Oliver, heretofore Secretary, Treasurer and Auditor, was appointed General Manager, Secretary and Treasurer, succeeding Charles Hamilton, who remains as Vice-President.

Union Pacific.—The office of Treasurer J. G. Harris has been removed from Boston to New York. A. G. Shearman, heretofore District Passenger Agent at Cincinnati, O., has been appointed General Agent of the passenger department, with headquarters at the same place. The appointment took effect Feb. 1.

#### RAILROAD CONSTRUCTION, Incorporations Surveys, Etc.

ALASKA & NORTHWESTERN.—This company was incorporated in West Virginia, Feb. 2, with a capital of \$6,000,000 to build a line from the Lynn Canal north through the Chilkoot Pass or other accessible routes to the northern boundary of Alaska. The incorporators are Pierre Humbert, Jr., T. J. Scollans, S. W. Jones, F. W. Ames, Boston, Mass.; George Campbell, Philadelphia. The principal office is to be Providence, R. I. This is the same road for which a bill was introduced into the House of Representatives by Mr. McCall granting right of way. (See this column under "Alaska Railroads" for Jan. 21.)

ALLIANCE & NORTHERN.—According to report,

this road proposes to extend its line during the coming Summer from Phalanx, O., northwest about 8 miles to Southington. The present road extends from Alliance 25 miles north to Phalanx.

BALTIMORE & OHIO.—Official statement is received that the Salisbury branch is to be extended between three and four miles further into the Meyersdale region to open up large tracts of coal land not now accessible to any railroad. (See this column for Jan. 7.)

BUFFALO, ROCHESTER & PITTSBURGH.—The Board of Directors, at a meeting held on Jan. 27, entered into a contract with the Allegheny & Western to lease its line, when complete, from Punxsutawney, Pa., west about 98 miles to New Castle, Pa. The Allegheny & Western is to be built under the supervision of the Buffalo, Rochester & Pittsburgh, one-half its cost being represented by 6 per cent. stock and one-half by 100-year first mortgage 5 per cent. bonds. According to the terms of the lease, both dividends on stock and principal and interest on the bonds are guaranteed by the Buffalo, Rochester & Pittsburgh. The amount of bonds is limited to \$2,500,000, and these can be issued only after the proceeds of a corresponding amount of stock at par have been expended on the road. With the consent of the holders of two-thirds of the outstanding stock of the Allegheny & Western the Buffalo, Rochester & Pittsburgh may issue additional stock to pay for double-tracking the road, the dividends on this stock to be at no more than 6 per cent. This contract is made subject to its approval by the stockholders of the Buffalo, Rochester & Pittsburgh at a meeting to be held at Ridgway, Pa., April 14. Stockholders of the Buffalo, Rochester & Pittsburgh are permitted to subscribe to \$1,920,000 of the new stock in the proportion of four shares of new stock to every 25 shares of old, common or preferred stock, but notice must be given on or before March 15, accompanied by a check for 10 per cent. of the par value. The Jefferson & Allegheny was recently merged with the Allegheny & Western. (See this column for Jan. 28.) At New Castle, Va., the line is to connect with an extension of the Northern Ohio Line of the Lake Erie & Western, which is to be built from Akron, O., 85 miles. A traffic contract is said to have been agreed upon between the two companies, and the entire line is to be put into operation within the year.

The cut-off of 5.5 miles from Lane's Mills, Pa., to Falls Creek on the Pittsburgh Division, is stated to have been completed, and east-bound freight trains are running over it. This shortens the line between these points by 3.52 miles. (See this column for Jan. 14.)

CANADIAN ROADS.—The Great Commonwealth Development & Mining Co. has obtained a charter from the British Columbia Government and now asks for a Dominion charter to build a railroad from Edmonton northwest via Ft. Assiniboine, Sturgeon Lake, Ft. St. John, on the Peace River, through the Peace River Pass, across the northeast corner of British Columbia to Ft. Halkett on the Laird River, up the Frances and along the Finlayson to the Pelly, which is a branch of the Yukon; then down that river to Ft. Selkirk and Dawson. This would form a road of about 1,600 miles.

CUMBERLAND MOUNTAIN.—Surveys are reported to be in progress from Glen Mary, Tenn., a point on the Cincinnati Southern, southwest about 40 miles to Monterey, a point on the Nashville & Knoxville. This road was incorporated in October. (See this column for Oct. 8.) James M. Dobbins of Cincinnati, O., and Charles H. Williams, Georgetown, Ky., are among those interested. The right of way has been secured and construction will begin as soon as surveys are completed.

DEMOPOLIS & PENSACOLA.—This company was incorporated in Alabama, Feb. 3, with a capital stock of \$150,000, to build a line from Pensacola, Fla., north through the counties of Santa Rosa, Fla., and Escambia, Monroe, Clark and Marengo, Ala., to Demopolis. The incorporators are John C. Webb, John R. Robertson, Morris Mayer, John C. Anderson, Benjamin F. Elmer, Thomas F. Howze and W. H. Welch.

ERIE.—Official statement is received that this company is preparing plans for new coaling pockets at Hornellsville and Port Jervis, N. Y., but it is very doubtful whether they will be built this year.

GILA VALLEY, GLOBE & NORTHERN.—Fully 1,500 of the Apache Indians assembled at San Carlos, Ariz., Feb. 9, gave their assent to the building of this line through the San Carlos Reservation. The road is to extend from Geronimo, Ariz., northwest 60 miles to Globe, and it is expected that work will begin by March 1. (See this column for Jan. 28.)

GRAND TRUNK.—This company is reported to have purchased a large block of property in Toledo, O., for the purpose of locating terminals in that city. The land is on a direct line with the proposed new Ottawa Beach resort.

GREAT NORTHERN.—Surveyors, according to report, have begun surveys for a cut-off west of Grand Forks, N. D., from Grand Forks Junction, north about six miles to Schurmeier. When this cut-off is completed the company will be spared the expense of running trains through the city.

ILLINOIS CENTRAL.—Official statement is received that grading has been completed on the entire five miles of the extension of the Chicago & Texas line of this company from McClure, Ill., south to Gray's Point, on the east bank of the Mississippi. Track laying has been completed for three miles from McClure, but no ballasting is yet done. About 125 men are at work. Contracts covering the whole work were let some time ago.

MANITOBA & NORTHWESTERN.—This railroad, according to report, has been purchased by the Canadian Pacific, with which it is proposed that consolidation shall be made and an extension built northwest through the valley of the Saskatchewan to Peace River. The Manitoba & Northwestern extends from Portage la Prairie to Yorkton, Manitoba, 223.5 miles, with a branch from Blincauth to Russell, 11.5 miles, and holds a lease of the Saskatchewan & Western from Minnedosa to Rapid City, 15.47 miles.

MCLOUD RIVER.—Official statement is received that this road has been completed from Upton, Cal., on the Southern Pacific, south 20 miles to McCloud. An extension is contemplated toward Alturas, Modoc Co., 70 miles, for which the maximum grade will be

4 per cent. and the maximum curves 14 degrees. There will be no bridges, trestles or tunnels, all depressions being filled solid. The road is planned to be an important feeder of the Southern Pacific. The officers are given in another column. (See this column for Jan. 28.)

MIDLAND OF NOVA SCOTIA.—Financial and other arrangements are reported to have been completed for building this long promised road, which is to extend from Truro, N. S. to Windsor, 60 miles. A contract has been let to Fitzpatrick Bros. of New Castle, N. S., and it is expected that the road will be graded and the rails laid by next Fall, ready for ballasting the following Spring. Alfred Putnam of Maitland is a director.

MOBILE & OHIO.—According to report, this company is to build a belt line around the City of Mobile, Ala., from Pritchard Station on that road north of the city, around the west border to a point on the Mobile, Jackson & Kansas City, about 8 miles.

MOSCOW & NORTHEASTERN.—Official statement is received that this road is to be built from Moscow, Idaho, directly east 40 miles to a point on the main stream of the Potlache River. It is to run through a vast body of white pine timber, for which it is to afford an outlet. George Creighton is president and C. O. Brown, General Manager, both of Moscow, Idaho.

MUSKOGEE COAL & RAILWAY.—This company was incorporated in Oklahoma Territory, Feb. 4, with a capital stock of \$1,250,000, to build a line from Ft. Gibson in the Cherokee Reservation, Ind. Ter., through the Cherokee and Creek Reservations and Oklahoma Territory to Vernon, Tex. A bill has been introduced into the Senate granting the right to build through the Indian Reservations. (See this column for Jan. 28.) According to report, a contract has been let for 35 miles of road and the citizens of Guthrie, Okla., are to give a bonus of \$50,000. The incorporators are T. H. Connors, E. H. Brown, C. G. Horner, J. W. McNeal, W. H. Gray, U. C. Guss and F. H. Greer.

NEW ROADS.—The capital has been obtained and right of way secured for a branch of 1½ miles from the Southern Railroad at Dogwood, Ala., to the mines of the Lump Coal Mining Co. The contract for building is about closed. W. E. Brinkerhoff of Dogwood, Ala., is secretary and treasurer of the Mining Co.

PECOS VALLEY & NORTHEASTERN.—The reorganization committee has agreed upon a plan of reorganization whereby the old mortgage is to be canceled and the bondholders to receive \$1,200 for each bond in the preferred stock of the new company. New bonds have been subscribed for sufficient to build the proposed extension of 208 miles from the present terminus at Roswell, N. M., northeast to Washburn, Tex. (See these columns for Feb. 11.) The road went into the hands of a receiver in June, 1896.

PENNSYLVANIA.—The double-tracking of the West Jersey & Seashore Division from Camden, N. J., to Atlantic City, 58.07 miles, is reported to have been completed and trains are running along the entire line. (See this column for Jan. 21.)

PITTSBURG, BESSEMER & LAKE ERIE.—The last brick on the great tunnel is reported to have been laid, which practically completes the entire line to Pittsburgh. (See this column for Dec. 17.)

PRESCOTT & EASTERN.—Bids have been asked for grading this line from a point near Prescott, Ariz., on the Santa Fe, Prescott & Phoenix, southeast 26.4 miles to Mayers. This road was incorporated some months ago. (See this column for Oct. 8.) F. M. Murphy of Prescott is president.

RESTIGOUCHE & WESTERN.—This company which was granted a charter by the New Brunswick Government some months ago (see this column for May 14) to build a railroad from a point on the Bay of Chaleurs, southwest about 110 miles to the St. John River, has had 20 miles of the line located and proposes to push the entire road to completion as early as possible. The principal office is Woodstock, N. B.

ST. LOUIS & OKLAHOMA CITY.—This company has been organized in St. Louis to build a line from Sapulpa, Ind. Ter., west 108 miles to Oklahoma City. The road is practically an extension of the St. Louis & San Francisco referred to under that name in this column for Feb. 4. But contrary to the statements made in the press, the St. Louis & San Francisco does not guarantee the bonds nor assume any financial obligations for the new road. The line, however, will be operated under a traffic contract by the St. Louis & San Francisco upon its completion, Sept. 1 next.

Official statement is received that contracts for building this line were let Feb. 4 to Johnson Bros. & Fraught of St. Elmo, Ill. M. S. Carter & Co. are to have the contract for bridges and buildings. The work is not difficult, since it is about the average of railroad building in the West. The maximum grade is about 1 per cent. and the maximum curvature 4 degrees. There will be one steel bridge of 135 ft. span and nine girder spans of 60 ft. There will be no tunnels and only a small amount of trestle. Bonds to the amount of \$2,052,000 have been subscribed for by the people of St. Louis and Oklahoma. C. G. Jones of the Planters' Hotel, St. Louis, Mo., is President and J. F. Hinkley of Sapulpa, Ind. Ter., Chief Engineer.

SULTAN VALLEY.—This company has been organized in Seattle, Wash., with a capital stock of \$1,000,000, to build a road from Tidewater at Port Gardner Bay to the head of the basin of the Sultan River to reach the property of the Forty-Five Consolidated Mining Co. Among the incorporators are Fred Hinkley, Frank S. Griffith and W. F. Brown. C. K. Janner of Seattle is attorney for the mining company.

WASHINGTON TERMINAL.—A bill has been introduced into the Virginia Senate to incorporate this company with a capital of \$2,500,000, authorizing it to purchase or build lines of railroad and other property in Virginia and the District of Columbia, including the long bridge across the Potomac River. The company is designed to improve the terminals of the Baltimore & Potomac line of the Pennsylvania at Washington, and to include in its ownership as much of that line as is necessary for that purpose. The incorporators are Frank Thompson, President of the



Pennsylvania, Philadelphia; Samuel Spencer, M. E. Ingalls, H. Walters, John P. Green, Charles E. Pugh and Samuel Rea.

### Electric Railroad Construction.

**AKRON, O.**—The directors of the Akron & Cuyahoga Falls Rapid Transit Co. will make a report at the annual meeting of the company, March 9, on plans for extending the road in Akron and for establishing an electric lighting plant.

**BOUND BROOK, N. J.**—The Bridgewater Township Committee ended its long-continued struggle with the New York & Philadelphia Traction Co. by granting a franchise to run cars over the Bridgewater turnpike between Somerville and Bound Brook. This annuls the litigation now pending in the Supreme Court on the old franchise.

**BRIDGEPORT, CONN.**—The Bridgeport Traction Co. has been granted permission to extend its lines from Southport, the present terminus, to Westport, a distance of four miles.

**BRIDGEPORT, N. J.**—The Bridgeport City Council has granted the Bridgeport & Millvale Traction Co. the right to lay tracks southward to the city line. It is reported that the company contemplates extending its line to Fairton, Westcotts and Cedarville.

**BROCKTON, MASS.**—The Brockton & East Bridgewater Street Railway Co., it is reported, has petitioned for authority to issue \$40,000 worth of bonds in addition to those already issued. These bonds are to be devoted to equipment purposes.

**CHICAGO, ILL.**—The Chicago City Railway Transit Co. has been incorporated with a capital of \$1,000,000. The incorporators are Frank R. Greene, secretary of the Chicago City Railway Co.; John J. Fitzpatrick, John P. Johnson, Charles R. Compton, Henry Brown, William J. Bartram and J. Lyle Turner. All the incorporators, it is stated, are employees of the Chicago City Railway Co. The company proposes to build an elevated railroad in the downtown district at a cost upward of \$2,000,000, and it is stated will be built for electric cars. The cars of the Chicago City Railway will be taken on the elevated structure on an inclined plane near Twenty-second street or by means of the viaduct which is to cross Clark street at Sixteenth when track elevation there is completed. The route will be as follows: From a point near Twenty-second street, not yet fully determined upon, into Dearborn street; north on Dearborn to Fourteenth; thence east to Plymouth place, and north on Plymouth place to Jackson street; thence west again to Dearborn street, and thence north in Dearborn street to a terminus at the river somewhere between Dearborn and State streets.

**DANVILLE, ILL.**—The Danville Gas, Electric Light & Street Railway Co. is attempting to secure a 50-year franchise from the City Council. The company's franchise was granted seven years ago, and it has 13 years to run. The corporation desires to extend its tracks to the new Soldiers' Home and double its tracks through the city.

**DOYLESTOWN, PA.**—The Bucks County Railway Co. and the Pennsylvania Railroad Co. have signed an agreement giving the Doylestown & Willow Grove electric road the privilege of laying its rails beneath the bridge of the Trenton cut-off railroad. All opposition has thus been removed, and the tracks of the trolley road will soon be completed between Doylestown and Willow Grove.

**EAST ST. LOUIS, ILL.**—The East St. Louis Electric Railroad Company will make a number of extensions this spring, including lines on Collinsville avenue, St. Clair avenue and Ninth street.

Work on the St. Louis, Bellville and Suburban Railroad ("Railroad Gazette," Dec. 31, 1897), is now completed over half the distance from East St. Louis to Bellville.

**FARGO, N. DAK.**—It is reported that a company has applied for a franchise to build an electric railroad from Fargo to Moorhead. One Charles A. Baker, of St. Louis, Mo., is mentioned in connection with the enterprise.

**NEW BEDFORD, MASS.**—The New Bedford, Middle-town & Brockton Street Railway Co. has been formed, with a capital of \$325,000, to build an electric railroad from Clark's Point, New Bedford, through Freetown, Lakeville and Middleboro to Bridgewater, where it will connect with the Brockton, Bridgewater & Taunton Street Railway, making a line 3 1/2 miles long. The directors are Fred. C. Hinds, of Newton; Charles H. Wilson and William M. Butler, of Boston; Rufus A. Soule, Abbott P. Smith and Charles S. Mendell, of New Bedford; Augustus M. Bearse, of Middleboro, and John M. Stetson, of Bridgewater.

**NEWTON, MASS.**—The Railroad Commissioners have granted the Newtonville & Watertown Street Railway Co. permission to extend its tracks from the Watertown line to Union Square in Brighton district, Boston.

**PARKERSBURG, W. VA.**—We are officially informed that the new Parkersburg Gas, Electric Light & Street Railway Co. is a consolidation of the old Parkersburg Gas Co., the Parkersburg Electric Light Co. and the Parkersburg City and Suburban Street Railway Co. The old gas and electric companies have been in existence for a good many years. The railway company had been recently organized, and had just begun the construction of a road which at present contemplates covering only the streets of this city and the adjacent suburban villages, making a trackage of about eight miles. The new management expect to have the entire road completed and running by the first of June.

**PATCHOGUE (L. I.), N. Y.**—We are officially informed concerning the Patchogue & Port Jefferson Traction Co. that the company has accepted the franchises as granted by the Highway Committee of the town of Brookhaven; also, the franchises as granted by the Village Trustees of the incorporated village of Patchogue. Their franchises are complete, and they are ready to proceed with the construction work. The length of the road is 15 miles, running from the Great South Bay, or Patchogue, to the Long Island Sound at Port Jefferson, across

Long Island, passing several small villages on the line. The prospect is good for the road being in operation by July 1.

**PHILADELPHIA, PA.**—The Philadelphia & West Chester Traction Co. asks the West Chester Council for the right of way along Gay street, with a view to extending the line from Newtown Square.

**PORTSMOUTH, N. H.**—The Portsmouth, Kittery & York Street Railway Company, recently organized under the Maine laws, will build from York to Kittery, Maine, and to Portsmouth, N. H. Another is projected from Kittery to Dover by way of Elliot, for which the company has bought the charter of the Elliot & Kittery Street Railway, granted by the last Legislature.

**ST. LOUIS, MO.**—The City Council, Feb. 11, passed and the House of Delegates signed the North & South Railroad bill, which provides for 95 miles of new street railroad.

**SYCAMORE, ILL.**—We are officially informed concerning the Lake Geneva, Sycamore & Southern Electric Railway ("Railroad Gazette," Dec. 31, '97) that the length of the road will be about 110 miles and that nearly all the line has been surveyed. The maximum grade is 3 1/2 per cent. Right-of-way has been mostly secured. The capital stock is \$155,000. The officers are: Geo. B. Morris, Secy.; C. D. Rogers, Treas.; John B. Whalen, Gen. Mgr.; Hon. James Branan, Chairman Executive Committee. The route is as given in our former report.

**TITUSVILLE, PA.**—The Titusville Electric Traction Co., of which the "Railroad Gazette" has had already several reports, expects to complete its road from Titusville to Pleasantville early this season. The distance is 10 miles. Geo. H. Dunham, of Pleasantville, is the general manager.

**WARREN, PA.**—The Warren Electric Street Railroad Co. will build an extension of about one mile this Spring. D. H. Luggins, Genl. Mgr.

**WORCESTER, Mass.**—A bill for the incorporation of the Worcester, Milford, Attleboro & Woonsocket Street Railway Company was recently presented in the Legislature. The promoters of the road are William S. Reed, Leominster; George W. Wiggins, Joseph G. Ray, Edgar K. Ray, and Oristes F. Doe, Franklin; Edward H. Rathbun, Woonsocket; Chas. W. Shippee, Milford, and William H. Tylee, Worcester. The capital stock of the new corporation is fixed at \$350,000, but the company is allowed to increase from time to time under the general laws.

### GENERAL RAILROAD NEWS

#### RAILROAD EARNINGS.

Showing the gross and net earnings for the periods ending at the dates named.

December 31:	1897.	1896.	Inc. or Dec.
Atlantic & Danville.			
6 months.....	Gross \$280,879	\$277,131	I. \$3,748
6 ".....	Net 80,887	67,770	I. 13,117
12 ".....	Gross 541,123	545,384	D. 4,261
12 ".....	Net 146,211	126,357	I. 19,854
Baltimore & Ohio Southwestern.			
1 month.....	Gross \$606,462	\$546,291	I. \$60,171
1 ".....	Net 206,091	188,395	I. 17,696
6 months.....	Gross 3,488,997	3,172,024	I. 316,973
6 ".....	Net 1,138,022	1,025,400	I. 112,622
12 ".....	Gross 6,556,971	6,179,617	I. 377,354
12 ".....	Net 1,995,315	1,940,016	I. 55,299
Boston & Maine.			
3 months.....	Gross \$4,900,046	\$4,900,993	I. \$949,053
3 ".....	Net 1,546,495	1,444,019	I. 102,476
6 ".....	Gross 10,655,943	10,413,242	I. 242,701
6 ".....	Net 3,464,445	3,239,570	I. 224,875
Central Pacific.			
1 month.....	Gross \$1,141,951	\$945,612	I. \$196,339
1 ".....	Net 398,434	295,200	I. 103,234
Choctaw, Oklahoma & Gulf.			
12 months.....	Gross \$1,286,661	\$1,124,354	I. \$162,307
12 ".....	Net 437,890	273,755	I. 164,135
Delaware & Hudson Leased Lines.			
Albany & Susquehanna.			
3 months.....	Gross \$1,179,266	\$1,131,549	I. \$47,717
3 ".....	Net 683,293	639,991	I. 43,302
New York & Canada.			
3 months.....	Gross \$230,424	\$229,088	I. \$1,336
3 ".....	Net 91,517	107,397	D. 15,880
Rensselaer & Saratoga.			
3 months.....	Gross \$591,656	\$590,599	I. \$1,057
3 ".....	Net 264,332	255,974	I. 8,358
Erie.			
3 months.....	Gross \$8,232,531	\$7,823,551	I. \$408,980
3 ".....	Net 2,528,846	2,396,300	I. 132,546
Illinois Central.			
6 months.....	Gross \$14,087,301	\$14,409,243	I. \$321,942
6 ".....	Net 4,620,290	3,419,647	I. 1,200,643
Kansas City, Fort Scott & Memphis.			
6 months.....	Gross \$2,645,925	\$2,345,156	I. \$300,769
6 ".....	Net 834,282	768,050	I. 66,232
12 months.....	Gross 4,914,223	4,481,739	I. 432,484
12 ".....	Net 1,519,591	1,422,842	I. 96,749
Kansas City, Memphis & Birmingham.			
12 months.....	Gross \$632,272	\$657,052	D. \$24,780
12 ".....	Net 173,650	203,675	D. 30,025
Manhattan Railway.			
3 months.....	Gross \$2,597,186	\$2,482,990	I. \$114,196
3 ".....	Net 1,239,101	1,135,600	I. 103,501
6 months.....	Gross 4,567,424	4,443,488	I. 123,936
6 ".....	Net 1,944,633	1,836,652	I. 107,981
Missouri, Kansas & Texas.			
1 month.....	Gross \$1,184,353	.....	.....
1 ".....	Net 394,648	.....	.....
6 months.....	Gross 7,944,473	.....	.....
6 ".....	Net 2,792,293	.....	.....
New York, Chicago & St. Louis.			
3 months.....	Gross \$1,712,409	\$1,476,246	I. \$236,163
3 ".....	Net 479,399	438,819	I. 40,580
6 months.....	Gross 3,239,978	2,822,251	I. 417,727
6 ".....	Net 846,978	753,978	I. 93,000
New York, New Haven & Hartford.			
3 months.....	Gross \$7,588,819	\$7,384,677	I. \$204,142
3 ".....	Net 2,285,245	2,401,124	D. 115,879
6 months.....	Gross 15,336,969	15,277,609	I. 59,360
6 ".....	Net 5,687,171	5,223,545	I. 463,626
New York, Ontario & Western.			
3 months.....	Gross \$1,031,401	\$991,479	I. \$39,922
3 ".....	Net 348,229	352,480	D. 4,251

#### Oregon Short Line.

12 months..... Gross \$30,282,692 \$29,493,548 I. \$789,144

12 "..... Net 10,943,701 9,345,774 I. 697,927

#### Philadelphia, Reading & New England.

3 months..... Gross \$195,203 \$173,954 I. \$21,248

3 "..... Net 61,559 41,690 I. 20,169

#### Pittsburg & Western.

1 month..... Gross \$229,731 \$197,381 I. \$32,350

1 "..... Net 76,081 53,433 I. 22,648

6 months..... Gross 1,662,767 1,417,220 I. 245,547

6 "..... Net 570,661 503,686 I. 6,975

#### Southern Pacific.

12 months..... Gross \$59,890,142 \$48,646,103 I. \$2,244,039

12 "..... Net 18,763,403 16,742,066 I. 2,021,337

#### Summit Branch Railroad.

12 months..... Gross \$850,197 \$950,284 D. \$100,087

12 "..... Net 95,106 98,080 D. 2,974

#### Union Pacific.

1 month..... Gross \$1,728,688 \$1,402,977 I. \$325,711

1 "..... Net 713,419 442,942 I. 270,477

12 months..... Gross 19,420,984 16,490,510 I. 2,930,474

12 "..... Net 7,227,075 5,800,976 I. 1,426,099

#### Union Pacific, Denver & Gulf.

12 months..... Gross \$3,554,577 \$3,101,716 I. \$452,861

12 "..... Net 879,424 638,238 I. 241,186

#### January 31:

1898. 1897. Inc. or Dec.

#### Baltimore & Ohio.

1 month..... Gross \$2,071,851 \$2,014,844 I. \$57,007

7 months..... Gross 16,112,256 15,464,193 I. 648,063

7 "..... Net 4,406,518 3,676,094 I. 730,424

#### Nashville, Chattanooga & St. Louis.

1 month..... Gross \$162,072 \$143,051 I. \$19,021

1 "..... Net 148,241 138,052 I. 10,189

7 months..... Gross 3,372,901 2,979,070 I. 393,831

7 "..... Net 1,297,646 1,148,449 I. 59,197

#### BALTIMORE, CHESAPEAKE & ATLANTIC.

Offer is made by B. H. Hollins & Co., of New York City, for sale at par and interest of \$1,000,000 first mortgage 5 per cent. gold bonds, due 1934. These bonds are part of an issue of \$1,250,000 secured by a first and only mortgage on all the property of the company.

**BLUE RIDGE & ATLANTIC.**—Judge Newman at Atlanta, Ga., Feb. 7, confirmed the sale of this road for \$2,400 to George Lewis Prentiss of New York, who represented the holders of receivers' certificates. The road was offered for sale Aug. 7, the upset price being \$75,000, but as the highest bid was only \$40,000, Judge Newman refused at that time to confirm the sale. The road extends from Cornelia, Ga., to Tallulah Falls, 20.9 miles. The receiver was appointed March 14, 1892.

**BOSTON TERMINAL.**—The Massachusetts Railroad Commissioners have authorized the trustees of this company to issue \$3,000,000 additional 3 1/2 per cent. bonds, making the total issue to date \$12,000,000. The company was incorporated June 9, 1896, to build a passenger terminal for all the railroads entering Boston on the south side. The New York, New Haven & Hartford is a fifth owner. The company has taken from the Boston & Albany 84,185 ft. of land and from the Old Colony 261,514 ft., to be paid for according to appraisal.

**BUFFALO, ROCHESTER & PITTSBURG.**—The sum of \$25,881 has been set aside for the purchase of Jefferson & Clearfield Coal & Iron Co. first mortgage 5 per cent. gold bonds at a price not to exceed 105 per cent. and accrued interest. Sealed proposals will be received up to March 22 by the Guaranty Trust Co. of New York.

**CHARLESTON & WESTERN CAROLINA.**—A syndicate headed by the Maryland Trust Company of Baltimore has purchased the entire issue of \$720,000 new first mortgage gold bonds of this company. This line extends from Port Royal, S. C., to Augusta, Ga., 112 miles, and from Augusta, Ga., to Spartansburg, S. C., 133.1 miles, with branches from Laurens to Greenville, S. C., 36.3 miles, and from McCormick to Anderson, S. C., 57.75 miles, making a total of 339.15 miles. The road has become a part of the Atlantic Coast Line, which purchased its entire capital stock, and the headquarters have been removed to Wilmington, N. C. (See this column for Jan. 7.)

**CHICAGO, ROCK ISLAND & PACIFIC.**—At a special meeting of the stockholders held in Chicago, Feb. 15, the proposed refunding plan was ratified. As stated in this column for Dec. 3, the plan provides for an issue of not more than \$100,000,000 new bonds at a rate not to exceed 5 per cent. and maturing Jan. 1, 1988. From the proceeds of this issue will be taken up the extension and collateral five, \$40,394,000, and the debenture five, \$4,500,000, both subject to call at 105; also the Chicago & Southwestern seven, \$5,000,000, and first mortgage six, \$12,500,000, when these mature. The balance is to be reserved for the purchase of new property. Speyer & Co. of New York have purchased \$52,000,000 of these bonds, which are to bear 4 per cent.

**DOMINION ATLANTIC.**—At a meeting of the shareholders in London, Jan. 14, the directors were authorized to issue an additional \$150,000 of 4 per cent. second debenture stock, making the total amount outstanding £250,000 out of the £440,000 authorized March 17, 1896. The additional capital is to be used to provide for the development of the through business between Halifax, Boston and St. John.

**EAST & WEST OF ALABAMA.**—Judge Dowell, in the St. Clair County, Ala., Judicial Court, Feb. 11, decided that \$625,000 of receivers' certificates of this company held by the estate of Eugene Kelly, of New York City, were a prior lien on the property, and that the other bondholders could not come in without first liquidating all the claims of the Kelly estate, amounting to \$1,000,000. This line is now owned by the East & West Railroad, its successor, which was chartered on Jan. 11, 1894.

**EL PASO & NORTHWESTERN.**—Two mortgage bonds have been recorded in Lincoln County, N. M., given by this company to the New York Trust Co. The first is for \$1,500,000, covering the coal lands at Salado, N. M., and the other for \$3,500,000, covering the railroad. This is the new line being built from El Paso, Tex., northeast 165 miles to White Oaks, N. M. (See these columns for Jan. 21.)

**HARTWELL.**—This road was sold at public auction Feb. 5 at 11 a. m. at Hartwell, Ga., to J. S. B. Thompson and Sanders McDaniel, representing the bondholders, for the sum of \$40,000. Eugene Dodd



was Special Commissioner. The decree of sale was issued by Judge Newman of Atlanta, Ga., some weeks ago, to satisfy a mortgage of \$20,000 given by the company in 1888. The road extends from Hartwell, Ga., to Bowerville, 10 miles. (See this column for Jan. 14.)

**KINDERHOOK & HUDSON.**—The reorganization committee which consists of Dean Sage, William H. Traver and John D. Parsons, Jr., has issued a statement showing that the committee has received \$11,076 from the assessments on the \$362,500 of assessed bonds of the old Kinderhook & Hudson. Of this \$11,076 has been expended for reorganization purposes, leaving \$1,000 to be refunded. The issue of new bonds is for \$160,000, of which \$10,000 is to be held in the treasury. The stock was fixed at \$170,000, of which 60 per cent. is to be held by the committee until deemed wise to distribute it to the stockholders. The new company was organized April 11, 1896, the property having been sold under foreclosure on March 7 preceding.

**KANSAS CITY, MEMPHIS & BIRMINGHAM.**—The earnings of this line of the Kansas City, Fort Scott & Memphis for the year ended June 30, according to the sixth annual report, was as follows:

Year:	1897.	1896.	Inc. or Dec.
Oper. exp.....	926,210	965,890	D. 39,680
Gross earn.....	\$1,241,393	\$1,189,651	I. \$51,742
Net earn.....	\$315,183	\$223,761	I. \$91,422
Other income.....	25,791	25,750	I. 41
Total.....	\$340,974	\$249,511	I. \$91,463
Interest.....	198,085	176,965	I. 21,120
Surplus.....	\$142,889	\$72,546	I. \$70,342

**LOUISVILLE & NASHVILLE.**—August Belmont, chairman of the Board of Directors, announces that he has sold for that company to Vermilye & Co. \$12,500,000 of collateral trust five-twenty year 4 per cent. gold bonds, the proceeds to be used to retire the \$7,070,000 consolidated mortgage 7 per cent. bonds maturing April 1, 1898, and to pay the cost of improvements on the Paducah & Memphis Division and for other properties acquired. The new bonds are secured by deposit with the Central Trust Co., of New York, of \$14,000,000 unified fours and \$4,000,000 Paducah & Memphis bonds. The new bonds may be redeemed on sixty days' notice after April 1, 1903, or may be purchased in open market, the collateral being redeemed in blocks of not less than \$1,000,000.

**NEW YORK CENTRAL & HUDSON RIVER.**—Official statement is made that, in accordance with the plan of exchange of Lake Shore & Michigan Southern stock for New York Central & Hudson River bonds, recently adopted (see this column for last week), the Guaranty Trust Company of New York is made the agent of exchange. Persons delivering Lake Shore stock to this company on or before April 14 will receive temporary certificates entitling the holder to receive in exchange a \$1,000 New York Central gold bond for each five shares of Lake Shore stock.

**NEW YORK, ONTARIO & WESTERN.**—Referring to current reports that this company would shortly announce a plan for refunding its maturing bonds, President Fowler says: "The management has the right on June 1, 1899, to pay off its 5 per cent. bonds outstanding at 105, subject to six months' notice, and this notice will undoubtedly be given."

**NEW YORK, SUSQUEHANNA & WESTERN.**—The absorption of this company by the Erie will take place on the basis of 100 shares of New York, Susquehanna & Western preferred stock for 90 shares of Erie first preferred and 100 shares of New York, Susquehanna & Western common stock for 100 shares of Erie common. The holders of stock certificates for first and second preferred and common stock are asked to assent to the issue of \$13,000,000 preferred and \$13,000,000 common stock for the purpose. A majority of the stock, both common and preferred, of the New York, Susquehanna & Western, it will be remembered, was recently purchased by J. P. Morgan & Co., of New York. (See this column for Jan. 14.)

**SEATTLE & INTERNATIONAL.**—The Trustees of this company, on Feb. 11, ratified the sale of the company's property to the Northern Pacific, as detailed in this column for Feb. 4. More than 90 per cent. of the certificate holders assented.

**SOUTHERN PACIFIC.**—Notice is given that first mortgage bonds of the Southern Pacific branch will be redeemed to the amount of \$50,000, and bids are called for up to Feb. 28 at the office of the company, 4 Montgomery street, San Francisco, Cal.

**UNION PACIFIC.**—An order temporarily restraining the delivery of preferred stock under the agreement of Feb. 15, 1897, has been made by the United States Circuit Court for the Southern District of New York in the suit of George L. Verner against Louis Fitzgerald and others. J. P. Morgan & Co. thereupon announce that upon surrender of any certificates of interest, under this agreement, they will make payment of the cash payable thereon and deliver a memorandum therefor showing that the preferred stock deliverable under that agreement, in respect to such certificates, has not yet been delivered.

Two judgments were entered at New York, Feb. 16, against the Union Pacific, one for \$1,931, in favor of William H. N. Francis, the other for \$1,292, in favor of Charlton J. Barnes, the claims being on unpaid coupons of bonds of the Leavenworth, Topeka & Southwestern, the interest of which was guaranteed by the Union Pacific.

#### Electric Railroad News.

**BOSTON, MASS.**—The statement in this column Feb. 11 that the Norfolk Suburban Street Railway Co. had petitioned the Railroad Commissioners for permission to increase capital stock should read "Norfolk Southern Electric Street Railway Co.," which is a projected company.

Frederick S. Lane is president and John C. Lane, vice-president. The company was incorporated Dec. 1, 1896, to build a road from the terminus of the Norfolk Central Railway, in Norwood, through Walpole and Foxboro, to the New York, New Haven & Hartford Railroad depot in Mansfield, a distance of sixteen miles. Locations were granted by the towns through which the road was to run, and the money received from the sale of stock and bonds was to be devoted to the construction and equipment of the road.

**BROOKLYN, N. Y.**—The Van Brunt Street & Erie Basin Railroad Co. has applied to the Railroad Commission for authority to change its motive power from horse to electricity. As there is no opposition the application will probably be granted and the change made.

**CINCINNATI, O.**—Judge Taft, of the United States Court, has ordered the sale of the Main street line of the Cincinnati Inclined Plane Railway Co., which has been for some time in the hands of a receiver. P. B. Spence was appointed Commissioner to conduct the sale. He is instructed to accept no bids for less than \$90,000 for the southern portion of the line running from the Zoological Garden and \$187,000 for the portion running north from the Garden.

**LEWISBURG, PA.**—The Lewisburg, Milton & Watson Street Railway was formally opened Feb. 9 by President E. A. Tennis and Superintendent J. W. Cramp, with their invited guests.

**MONTCLAIR, N. J.**—The Essex County Board of Freeholders passed resolutions limiting to 90 days the time in which the North Jersey Traction Company must build its Bloomfield avenue line through Montclair. The Montclair Town Council now decides that a five-cent fare to Newark must be conceded by any company wanting to build through the town.

**NEW ROCHELLE, N. Y.**—The Board of Trustees will give a public hearing Feb. 28 on the application for electric railroad franchises now before the board. The applications are from the Union Railway Co., now controlled by the Third Avenue Railroad Co.; the New Rochelle Electric Railway Co., the Huguenot Electric Railway Co. and the Connecticut & Westchester Traction Co.

#### TRAFFIC.

##### Traffic Notes.

At Quincy, Ill., one night last week, the Freight Bureau gave a banquet to the officers of the railroads centering in that city. Nearly 200 persons were present.

The Kansas City, Pittsburg & Gulf has secured a large shipment from St. Paul for export to Europe. It is now bidding actively in this city for export freight and it is announced that the company will open an office here.

Mr. B. H. Helm, heretofore Contracting Freight Agent of the Louisville & Nashville, at New Orleans, has been chosen Commissioner of the New Orleans Bureau of Freight and Transportation. Mr. Helm has been with the Louisville & Nashville since 1884.

At San Francisco Peter D. Peterson has won a damage suit which he brought against F. F. Connor, General Agent of the Oregon Railroad and Navigation Company, for illegal arrest. Peterson had been charged with forgery in signing the name of another man to a ticket purchased from a scalper. The court held that after the ticket had been disposed of by the original purchaser, he ceased to have any right to it and Peterson could not be guilty of forgery in signing the former owner's name.

The Lehigh Valley, on the adoption of a new timetable, Feb. 20, will take off a number of local passenger trains which are unprofitable. Local newspapers say that more than 25 runs will be discontinued. Another account says that about a dozen crews will have to be dismissed or assigned to other work. In many cases these changes are necessitated by the increased competition of electric street car lines.

At a meeting of the Board of Control of the Joint Traffic Association last week a committee made a report recommending that east bound freight rates, lake and rail, should hereafter be 15 cents less than all rail (on the basis of first-class Chicago to New York) instead of 18 cents. It does not appear that the report was finally accepted; and a report recommending a reduction of the differential on west bound lake and rail freight was definitely rejected.

The State Railroad Commissioners of Tennessee have ordered the Nashville, Chattanooga & St. Louis to make a reduction of one cent a mile, from 4 cents to 3 cents, in the local passenger fares on the Fayetteville Division, between Fayetteville and Columbia. The Commission holds that this reduction should be made so as to make the rates uniform throughout this division, the lower rate being already in force between Decherd and Fayetteville.

The Merchants' Association of New York announces that the Central Passenger Association has reconsidered its former vote, and has agreed to make the reductions on excursion tickets to New York for merchants, as desired by the association. This has revived the enthusiasm of the association, and a committee of the Produce Exchange, which wants the help of the Merchants' Association in securing reductions in freight tariffs from the West, is going to help the Merchants in a further effort to secure reduced passenger fares from everywhere.

The Interstate Commerce Commission has brought three suits in the United States Court at Atlanta, Ga., against the Western & Atlantic and the Atlanta & West Point roads, for violation of the fourth section of the Interstate Commerce law. The suits have to do with complaints made in 1891 and 1892, the State Railroad Commission of Georgia being the complainant. The Interstate Commerce Commission passed upon the complaints in November, 1892, but the application to the court for the enforcement of its orders was postponed to await the settlement of the Social Circle case.

The railroads leading out of Galveston, Tex., have notified the Lone Star Line, the new steamship line that refuses to abandon its reduced-rate freight tariffs from New York, that they would not pro rate with the steamer line after Feb. 15. This is a part of the arrangement between the railroads and the other steamship lines to restore rates in spite of the refusal of the Lone Star Line to join in the restoration. The United States Court at Galveston has issued a temporary restraining order, forbidding the roads to carry out their alleged boycott of the Lone Star Line.

At Kansas City last Tuesday, the Kansas City, Pittsburg & Gulf Road secured from the United States Circuit Court a temporary order restraining the Atchison, Topeka & Santa Fe from enforcing its "boycott" against the former road. All the Southwestern roads gave notice recently that they would

refuse to continue joint traffic arrangements with the Kansas City, Pittsburg & Gulf Road at Texas points, because of its refusal to enter the Southwestern Traffic Bureau. The same action will, it is said, be taken against the other ten companies as their time limit expires, and an attempt to enforce the boycott is made.

John A. Smith, Manager of the Charleston (S. C.) Freight Bureau, has made his third annual report. It is addressed to the Mayor and Aldermen, the city being, we believe, a large contributor to the support of the Bureau. The report fills nearly five columns of the "News." It gives in detail the matters in which the Bureau has secured concessions from the railroads, and likewise those in which unsuccessful attempts were made. There is also a summary, filling a column, of general matters attended to by the Bureau. The statement is made that the Bureau is frequently able to quote to shippers lower rates than those named by the railroads, which is due to the fact that the tariffs and classifications are ambiguous, containing many descriptions which will bear different constructions.

#### Interstate Commerce Commission on Chicago Stock Yards Charge.

The Inter-State Commerce Commission, in an opinion by Commissioner Prouty, has announced its decision in the case of the Cattle Raisers' Association of Texas, against the Fort Worth & Denver City and others, involving the legality of the charge of \$2 per car imposed as a terminal charge at Chicago for delivering live stock at the Union Stock Yards.

The Union Stock Yards and Transit Company is not engaged as a carrier of live stock, and therefore is not subject to regulation in this case. Live stock carried by the railroad companies through different States for delivery to the Union Stock Yards is deemed to be inter-State commerce until delivered at such stock yards. The terminal charges dealt with by the commission are irrespective of the transportation charge to Chicago.

For many years the railroads delivered stock at the yards without charge, but when on June 1, 1894, the Stock Yards Company imposed a trackage charge the railroads made a terminal charge of \$2 a car. The commission decides that this charge should have been only enough to reimburse the roads for the amount paid to the Stock Yards Company; and that more than \$1 a car is in violation of Section 1 of the Inter-State Commerce law. The case is continued for proof of damages by members of the complaining Cattle Raisers' Association, all questions as to reparation being reserved until such proof is made.

#### Chicago Traffic Matters.

Chicago, Feb. 16, 1898.

The flour rate in the Northwest has spread to include the territory south of this city, the Illinois Central having made a reduction of 4 cents from Chicago to New Orleans and other Southern cities.

Eastbound freight rates are again demoralized, both grain and provisions for export being carried at figures far below tariff. Joseph Leiter is said to have made contracts with the Grand Trunk, the Lehigh Valley and the New York, Chicago & St. Louis for 500 car lots of wheat for Liverpool. The Chicago agents profess to know nothing about the rates on this wheat, but it seems to be generally understood that the price is about on the basis of 15 cents per 100 lbs. to New York, but the contracts may have been made in New York and not in Chicago, and the rates specified cover the transportation through from Chicago to Liverpool.

No final settlement of the passenger rate controversy between Chicago and Denver has as yet been reached. The latest development in the trouble is the report that the Rock Island road will put on a fast train, similar to those run by the Burlington & Northwestern companies. The Santa Fe, which is 200 miles longer than any of the other lines, threatens, if this is done, to reduce the fare 50 per cent., making a rate of \$14.50, Chicago to Denver.

The Western lines, notwithstanding they have threatened to boycott the Canadian Pacific, are making no headway in getting passenger rates to North Pacific coast points on a firm basis. The Canadian Pacific refuses to scare, and also flatly refuses to become a party to any conference having for its object an equalization of Alaska rates over American and Canadian lines.

The Western Passenger Association roads have for the second time refused to grant a large batch of excursion fares for conventions and other gatherings, and state that these applications must remain side-tracked until Congress has acted on the Anti-Scalping bill.

A proposition to abolish Sunday excursion rates in Central Passenger territory has been unanimously voted down.

A proposition to abolish the checking of baggage over the Eastern lines from residences has been laid over until the next meeting of the Central Passenger.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the Western terminal of the trunk lines for the week ending Feb. 10 amounted to 99,714 tons, as compared with 105,446 tons the preceding week.

Passenger men say that the ticket brokers are getting desperate and resorting to all kinds of means to unload upon the public old stock which has been accumulating for years. Either they are unable to get fresh tickets or they fear being left with old stock on their hands if the anti-scalping bill becomes a law. Several world's fair tickets have been taken up recently.

The fast Denver trains on both the Northwestern and the Burlington lines will have mail cars, for the whole or for parts of their trips.

This statement includes 65,335 tons of grain, 9,332 tons of flour and 12,696 tons of provisions, but not livestock. The following is the statement in detail for the two weeks:

	Week Ending February 10.		Week Ending February 3.	
Roads.	Tons.	P. C.	Tons.	P. C.
Baltimore & Ohio.....	8,796	8.9	5,942	5.6
C. C. & St. Louis.....	4,101	4.1	7,372	7.0
Erie.....	11,175	11.1	13,363	12.7
Grand Trunk.....	12,727	12.7	12,897	12.2
L. S. & M. S.....	15,434	15.4	15,943	14.3
Michigan Central.....	12,142	12.1	10,817	10.3
N. Y., Chi. & St. L.....	9,503	9.5	9,512	9.0
Pitts., Cin., Chi. & St. L.....	10,290	10.9	10,564	10.0
Pitts., Ft. Wayne & Chi. 12,837	12.8		14,625	13.9
Wabash.....	2,709	2.7	5,311	5.0
Totals .....	99,714	100.0	105,446	100.0